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VIEWS, NEWS AND INTERVIEWS

An unusual, but up-to-date, phase of the British–Transvaal war is contained in this paragraph from London *Electricity*: "It's an ill wind that blows nobody any good, and it seems that the demand made by the Government for horses from the authorities of the Liverpool tramways will have the effect of expediting the introduction of electric traction in that favored city. The number of horses 'commandeered' is 200, and for these the Corporation has been receiving an annual subsidy at the rate of £4 per head. The Council can claim for the horses at the rate of £50 a head, and will gain considerably upon the transaction, as the original cost of the animals was only £30 a head, and they would have had to be disposed of shortly in any case."

St. Petersburg and Moscow are now directly connected by telephone.

A young Danish engineer, according to *Engineering*, which does not give his name, has constructed a phonograph which will take telephone messages. It is said to be much simpler than the Edison phonograph, and instead of a wax roller has a steel band, from which the message can be wiped off after it has been delivered.

A Boston newspaper man makes the following complaint about "nickel-in-the-slot" telephones: "The public telephones that work on the nickel-in-the-slot principle have their drawbacks. The other evening I tried one, and after having deposited my money and calling up central I was informed that the line was busy. I waited ten minutes and the wire was still occupied, and five minutes later the same conditions prevailed. I could wait no longer, and I inquired of central what was to become of my money. Then I was told that if I sent a letter to the main office with a two-cent stamp enclosed the nickel would be returned to me. After figuring up that the postage would cost four cents and that my return would net me one cent, I concluded that I would let the matter drop. I find that many others have been treated in the same manner."

A hearing to the business men and property-owners in South Brooklyn, N. Y., and suburban districts, who are dissatisfied with the recent traffic changes of the Brooklyn Rapid Transit Company, was given by President Rossiter at the office of the company on November 15. In answer to criticisms of the new service President Rossiter said that he had learned from investigation that 80 per cent of the people were satisfied with the new arrangements. The objectors, he said, were mostly women and short-distance riders. The change was made principally for long-distance riders and to relieve the crush on the surface electric cars during business hours. Within the last three weeks, Mr. Rossiter said, more elevated cars than ever before have been run, and the majority of the passengers who patronize them are satisfied. Between the hours of seven and nine o'clock, both morning and night the company has all the surface cars in operation that can be run.

FIG. 1.—INTERIOR VIEW OF THE DYNAMO ROOM OF THE KINGS COUNTY ELECTRIC LIGHT AND POWER COMPANY, BROOKLYN, N. Y.

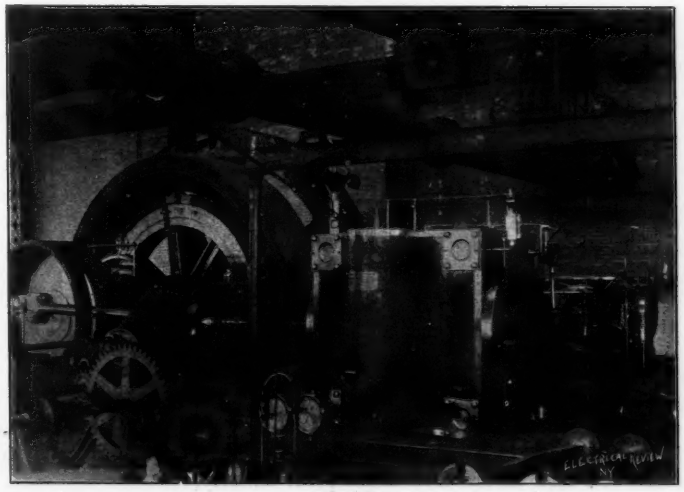


FIG. 2.—ONE OF THE MAIN GENERATING UNITS, KINGS COUNTY ELECTRIC LIGHT AND POWER COMPANY, BROOKLYN, N. Y.

BROOKLYN'S MODERN ELECTRIC LIGHT STATION.

THE GENERATING PLANT OF THE KINGS COUNTY ELECTRIC LIGHT AND POWER COMPANY, BROOKLYN, N. Y.

The advance in electric lighting in the few years that have elapsed since this means of illumination became general is well shown by comparing the modest little building shown in one of the illustrations, the first electric light station in Brooklyn, situated at 53 Liberty street, in that borough, with the superb structure of the Kings County Electric Light and Power Company.

This building fronts the East River at the foot of Gold street, in Brooklyn, and is a somewhat plain structure of red brick with a very high and imposing brick smoke-stack. The building rests upon concrete foundations of great strength laid on piles, and is of a most solid and substantial character. On the river side is a landing dock, consisting of a bay between two piers, in which barges and canal boats can rest free of the swift tidal currents of the East River. Coal will be delivered and ashes will be taken away by barges. One of the illustrations shows the coal-hoisting and conveying mechanism which handles the incoming fuel. At the end of the boiler house stands the steel tower shown in the illustration, surmounted by the crane which handles the buckets of coal, lifting them to the height of the platform at the top of the gabled roof. The conveyer carries the coal first to a crusher, which reduces the lumps so that none is larger than three inches in any dimension. This is to avoid the packing of the coal in its passage through the various automatic machines which it encounters. This crushed coal falls into a car standing on a scale and is weighed. The car is then allowed to run by gravity down a track over the coal pockets, and an adjustable latch

about three weeks. By that time it is expected that two of the four main generating units will be in operation.

The entire plant in all its details was planned and constructed by W. E. Crane, M. E., New England Engineering Company, and Thomas E. Murray, New York, consulting engineers.

The main engines, as well as the condensers, were built and installed by the Edward P. Allis Company, of Milwaukee, Wis.

The engines for the exciter sets were furnished by the Ball & Wood Company, of Elizabethport, N. J., and all the dynamos, both main generators and exciters, were supplied by the Westinghouse Electric and Manufacturing Company, of Pittsburgh, Pa.

The engine equipment possesses the latest safety device, the Monarch engine stop and speed limit, manufactured by the Monarch Manufacturing Company, Waterbury, Ct.

The coal-conveying and handling machinery in this plant was built by the C. W. Hunt Company, of Staten Island, N. Y.

The coal pockets were put in by the Hilton Bridge Company, of Albany, N. Y., which also built the architectural iron work of the buildings, including the large trussed roof of the engine room.

The boilers were supplied by the Stirling Company, of Chicago, through its New York offices, and the stokers were put in by the American Stoker Company, of New York.

The pumps were supplied by the George F. Blake Manufacturing Company, New York, and the feed-water heater by the Whitlock Coil Pipe Company, 204 Fulton street, New York. The "Climax" steam separators were furnished by Best, Fox & Co., Pittsburgh, Pa.

The crane in the engine room was built by the Case Manufacturing Company, of Columbus, Ohio, and the switchboard, with its fittings, was supplied by the General Electric Company, Schenectady, N. Y.

The Kings County Electric Light and Power Company was organized by Mr. A. M. Young, of Connecticut, who purchased the franchise from Mr. Charles A. Cooper and associates, of Brooklyn. Immediately following the purchase of the franchise, the Kings County company actively began its installation, Anthony N. Brady, Seth L. Keeney, Felix Campbell, William Berri, Walton Ferguson and Hon. W. F. Sheehan being associated with Mr. Young in the enterprise. The station described above was begun, and a very complete subway system planned and construction commenced. Soon after the Edison Illuminating Company of Brooklyn, which had purchased the Citizens' Illuminating Company and the Municipal Electric Lighting Company, was purchased by the Kings County company, and thus the entire lighting of this city of one and a half million inhabitants, and which is rapidly growing, is controlled by the one company, a small company, the Amsterdam, having been recently taken over.

The stockholders of the Kings County Electric Light and Power Company have agreed to lease the company's rights and franchises and possessions to the Edison Electric Company for a period of 38 years. The consideration is that the Edison company shall pay all the operating expenses, taxes and fixed charges of the Kings County company, and pay all the surplus earnings to the Kings County company, to be distributed as dividends at the discretion of the directors of that company. The Edison company owned all of the stock of the Municipal company and of the Citizens' company, and its own stock was owned by the Kings County company. If all of these companies were kept alive, there were different sets of officials, extra books to be kept, and, what was more important, duplicate taxes to be paid on franchises. The Citizens' company and Municipal company were, at the same time, merged into the Edison company, and will, in time, go out of existence. The Edison is now the single operating company, while the Kings County is the actual owner of every electric lighting franchise in the Borough of Brooklyn.

The ELECTRICAL REVIEW believes that the citizens of Brooklyn, as well as the stockholders of the Kings County company, are to be congratulated over the situation of affairs. From the organization of the company, and its magnificent modern equipment, electric lighting and electric power will undoubtedly be furnished as cheaply as is practical, and the enterprising men at the head of the Kings County company are a guarantee that every advantage will be taken of improvements and inventions that apply to this vast and constantly developing industry.

The amount of capital issued by the Kings County Electric Light Company is $1,950,000, and the amount of bonds issued covering all properties is $11,576,000. The officers of the Kings County company are:

President, Felix Campbell, Brooklyn.

Vice-president, Hugh J. Grant, Manhattan.

Treasurer, W. T. Wilson, Manhattan.

Secretary, E. F. Peck, Brooklyn.

SCIENCE BREVITIES.

Cathodes for Analysis—In the usual methods of quantitative analysis by electrolysis, the cathode is usually a platinum cone or cylinder, giving greater current on the exterior than in the interior, and an unequal deposition of the metallic deposit. In Oettel's improvement a platinum plate is used as cathode, with a fork-shaped anode, one arm on each side of the cathode. This is only partially successful in overcoming the difficulties, the deposit tending especially to scale off. In the *Berichte*, Clemens Winkler suggests the use of platinum gauze as a cathode, says *Science*. The metal is deposited very regularly even with strong current. It is in the form of a cylinder around each thread of gauze, is compact, firmly deposited, and shows no tendency to scale off, even at very considerable current strength. The time required is only about one-fourth as great as with the old form of electrode. Many solutions are therefore available which could not otherwise be used, as, for example, copper is readily deposited in large quantities from its sulphate solution.

Power Transmission—The Helios Company, of Cologne, are embarking upon what promises to develop into a very interesting undertaking, says the *Electrical Engineer*. It is nothing less than the erection of a large generating station in the province of Posen for the distribution of current for lighting and power purposes over an extensive agricultural district. The distributing mains will extend for a distance of fifteen miles round the station. Not only is it intended to supply energy for lighting purposes and dairy machinery, etc., but also for driving agricultural implements, such as threshing machines, plows and chaff-cutters. It is estimated that the scheme will cost about $1,300,000. Arrangements have already been made with many landowners for the annual plowing of their land. For this purpose forty plowing plants will have to be provided, since the work must be done between July 15 and December 1 every year, according to agreement. The charge for plowing will vary between $2 to $2.50 per acre. There already exist in Germany many plants which supply current for agricultural purposes, but only over a very limited area, and the above project is therefore unique in a sense so far as German practice is concerned.

A New Radio-Active Substance—In *Wiedemann's Annalen*, E. de Haën writes concerning a new radio-active substance. By extraction from a large quantity of uranium ore, the author has obtained substances which possess the properties ascribed by M. and Madame Curie to "radium" in an extraordinary degree. Two preparations have been made. Preparation A exhibits the properties of Becquerel rays. It excites fluorescence in a barium platinocyanide screen even across opaque substances, affects the photographic plate, makes air electrically conducting, and has an additional property not hitherto described, that of being itself strongly luminous. Preparation B possesses in general the same properties as preparation A, but the excitement of the screen is more intense, whereas the self-luminosity is feebler. In both cases the rays which produce fluorescence penetrate bodies like black cardboard more readily than they penetrate glass. Both preparations must be carefully preserved from moisture, especially the first preparation, which loses its own luminosity in a few hours when exposed to the moisture of the atmosphere. Once the luminosity is lost it is difficult to restore it. The only expedient which succeeds, as a rule, is that of melting the substance in the oxy-hydrogen blow-pipe.

A Magnetic Concentrating Plant—A contemporary describes the magnetic concentrator that has been used since January, 1898, at the Monteponi mine in Sardinia. It consists essentially of a fixed horseshoe electro-magnet, placed with its poles downwards. Below the poles is an endless rubber belt, a foot wide, at a distance that may be varied at will. A hopper feeds on to the belt a thin layer of the material to be treated, which is carried forward by this belt at a velocity of 1½ feet a second. In order to collect the portion attracted by the magnet, a second endless belt moves horizontally in a direction at right angles to the first, close to the poles of the magnet. The magnetic plant at Monteponi treats in 24 hours 24 tons of material, previously submitting to a reducing roasting. The material consists of silicate of zinc more or less ferriferous, limonite and zinciferous dolomite, materials of almost identical specific gravity. In the raw state the material contains on an average 22 per cent of zinc, a percentage which is brought up to 30 by roasting. The magnetic concentrator extracts about a third of iron ore, assaying 10 per cent of zinc, whilst the remaining product is brought up to 40 per cent of zinc. By treating this product in hydraulic jiggers the lime and magnesia from the dolomite are removed, and the final product—oxide of zinc—contains 48 per cent of zinc.

THE FELLING OF A CHIMNEY.*

BY FRANK REID.

The following is a short account of the felling of the large chimney at Wallsend on January 4, 1899:

The chimney was built in 1879, and being no longer required, the present owners of the ground (the Parson Steam Turbine Company, Limited) decided upon its removal.

The chimney was 266 feet high; at the ground level the outside diameter was 21 feet, and the inside 14 feet, and at the top the outside diameter was 14 feet, and inside 12½ feet, making the brickwork 3½ feet thick at the bottom and 9 inches at the top.

On examination, the writer came to the conclusion that he could fell the chimney in a nearly due south direction, where the ground was clear of all buildings.

On January 9, 1899, the workmen commenced cutting out the walls on both sides of the chimney, about three feet from the ground, working towards the point of direction of the fall, and as the brickwork was removed it was replaced with large wooden blocks 18 inches high, 15 inches wide and 12 inches long, carefully wedged up with thin hardwood wedges. The wooden blocks consisted of three deal boards, each 18 inches long, 3 inches thick and 12 inches wide, and each board was separated by two pieces of deal 7 inches by 3 inches by 12 inches, in order that tar and sawdust might be filled into the interstices and afford a larger burning surface. About 40 feet was cut out, and the chimney being at this point 66 feet in circumference, about 26 feet was left at the back.

The blocks being saturated with tar and paraffin, wood was then built for a fire all round the circumference of the chimney where the brickwork had been removed, the firing material being much larger at the point of direction of the fall of the chimney. For about a minute after the fire was lit workmen were employed throwing paraffin on the portion where the blocks were required to burn most rapidly, and six minutes after the lighting of the fire the chimney fell exactly on the line marked out for it on the ground.

The cost of felling the chimney was only half of that involved in its removal by ladders and throwing the material down, working from the top; and, moreover, many thousands of the bricks were recovered for further use.

*A paper read before the British Institution of Mining Engineers.

The First American Patent.

To the General Court of Massachusetts belongs the honor of granting the first American patent, remarks a New England paper. This was in 1648, and was then designated as a monopoly. It was confined to the region controlled by Massachusetts, and the one issue apparently included all the inventions of the inventor connected with engines that depended upon water for their motive-power. The limit of the monopoly was fourteen years, and the court not only retained power to forbid exportations, but to prevent exorbitant charges upon the public for their use. The patent was issued in this form:

"At a general Courte of Boston the 6th of the 3th Mo. 1648. The cor't consid'inge ye necessity of raising such manifactures of engins of mils to go by water for speedy dispatch of much worke with few hands, and being sufficiently informed of ye ability of ye petition to perform such workes grant his petitioner (yet no Other persen shall set up or use any such new invention, or trade for fourteen yeares without ye licence of him the said Joseph Jenkes) so farr as concernes any such new invention, & so it shall be alwayes in ye powr of this co'te to restrain ye exportation of such manifactures & ye prizes of them to moderation if occasion so require."

This inventor, Jenkes, or Jenks, as it would now be spelled, came from Hammersmith, England, settled in Lynn in 1643 and died in 1683, aged eighty-one. He was a blacksmith and machinist, made the dies for the coining of the "Pine Tree" money, and built the first fire engine in this country; altogether a man of great inventive genius and the ancestor of a large number of descendants. One of his sons removed to Rhode Island, where he built several mills.

An Electrical Applause Machine.

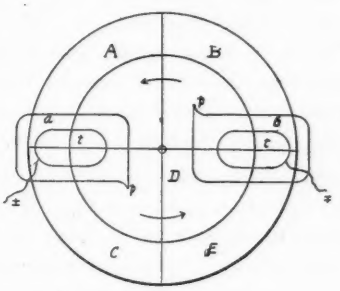
One has to go away from home to hear the news, sometimes. In an Italian contemporary appears the following, which is literally translated:

"To what numberless uses electricity can be put! An American theatrical impressario, not wishing to submit to the impositions of those hired to make applause, sought the aid of an electrician, who conceived the idea of building for the theatre an arrangement consisting of movable paddles conveniently covered with stuffed leather, which could be flapped together and reproduce faithfully the sound of hand-clapping. The apparatus were distributed in various parts of the house, and at the opportune moment were set going by pushing a button behind the scenes."

ELECTROSTATIC ROTATION—II.

BY ALFRED G. DELL.

Since making the experiments on electrostatic rotation, described in the ELECTRICAL REVIEW, of November 15, 1899, I have made further investigations of the subject. I stated in the above-mentioned article that I had the tinfoil on the cardboard disk of larger size on one side than on the other, and that the rotation was always from the smaller piece of tinfoil to the larger on the nearer side. I find after various experiments that it was the shape of the pieces of tinfoil used, not the difference of their sizes, that caused the rotation from the smaller to the larger piece, and that by changing their shapes I can



ELECTROSTATIC ROTATION.

obtain a rotation in the opposite direction, and that the pieces of tinfoil can be both of the same size.

I describe the experiments as made, which will enable any one to accomplish them with ease, and rotate the disk slowly or rapidly and in either direction desired. The changes can be made in a rapid manner without disturbing the mica disk.

Referring to the figure, *A*, *B*, *C*, *E*, is a disk of cardboard 3¼ inches in diameter, and *tt* are pieces of tinfoil with rounded corners, glued to the cardboard, and connected by wires with the springs described in the former article; *a* and *b* are pieces of sheet-brass laid loosely on the tinfoil. They are made bright and pointed at *p*, their sharp edges being filed off. *D* is the mica disk, 2¼ inches diameter, covered with a coat of shellac.

The rotation of the mica disk *D* is indicated by the arrows, with the arrangement of the brass plates shown in the figure. When *a* was turned so the point *p* was in the quadrant *A*, the mica disk oscillated backward and forward, sometimes turning part way around and then oscillating about the new position. When *a* was made a plate without a point, *b* remaining as in the figure, the motion was still from the point, but not as great as when both points were used, as in the figure.

When a large plate without a point was used on one side, and one with a point, such as *a* or *b* in the figure, on the other, the rotation was from the point of the smaller plate. If the larger plate had the point and the smaller one no point, the rotation was from the point on the larger plate towards the smaller one. In fact the rotation was always from the sharp point or points.

When two small plates without points were used and the rotation was little or none, the disk merely trembled.

When the points were placed outside of the mica disk, one in quadrant *B* and the other in *C*, the disk rotated in direction from the points, but the rotation was not as rapid as when they were directly under the mica disk.

To raise the points, located as in the figure, slanting them increased the velocity of rotation. When the plates were very close to the mica disk, the rotation was diminished. A mica disk intervening between the rotating disk and the cardboard checks the rotation. In the dark the positive discharges could be seen streaming from the point on the brass plate on the tinfoil attached to that side.

Any one reading the accounts of these experiments can see to what conclusions they lead. It appears to me that there is not a broken link in the chain, showing it is the electric repulsion of the discharges from the sharp points that drives the disk. While there is little seen in the dark at the negative point, it equally produces its effect. Each side acts entirely independently of the other. The experiments well repay any one the trouble of making them, as they are beautiful, either in the light or dark.

Chicago Edison Company.

The Whitney-Widener-Elkins syndicate has practically completed the purchase of the Chicago Edison Company. The company is now asking stockholders to deposit their stock and receive in exchange two four per cent bonds for each ten shares of stock in the old company and also fifty per cent in stock of the new company. Thus 100 shares of stock in the old company receives fifty shares of stock in the new company and $20,000 in the new company's bonds. The Whitney-Widener-Elkins syndicate has now secured the majority of the stock.

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ELECTRICITY SUPPLY OVER LARGE CITY AREAS.

It will be remembered that there were two camps of electrical engineers a few years ago holding diametrically different opinions about the best variety of electric current for general supply in cities. In fact, it was found out, after much contention between the advocates of alternating current on one side and direct current on the other, that the average station accomplished its best results by using a mixture of apparatus giving currents of three or four different qualities. It was not so long ago that a well designed station was supposed to contain large direct-current, low-voltage machines for driving nearby incandescent lights and motors, direct current generators of higher voltage for driving large motors, arc lighting machines and, generally, high-speed, single-phase, high-frequency alternators for incandescent lighting in outlying parts. It began to be thought that there was no way to unify the output of the station, and it was necessary for the polyphase system to be made practical before it was even dimly foreseen how the various supply services could be provided with current from a common source. On other pages of this issue is a description of an electric light station of the entirely modern type. Here all the output consists of current of one kind, and that kind is not adapted directly to electric lighting. On the supply mains, which ramify through the city which it serves, there is still the same variety of current supplied for the various uses to which it is applied, but at the generating station itself all the energy of the large engines is turned at once into high-pressure, low-frequency, three-phase current, which is most economical in distribution and exceedingly convenient to transform into any other kind that is necessary.

The Kings County Electric Light and Power Company, of Brooklyn, whose station is the one referred to above, finds itself in the most fortunate possible situation, in that it is able to centralize the energy supply of a vast metropolitan area of nearly two million inhabitants. Older stations, which a few years ago were looked upon as magnificent examples of engineering, find themselves converter substations under the new régime. It has been left to the enterprise and genius of American electric light men to conceive and carry into execution great plans of electric lighting on a truly metropolitan scale, and to Mr. A. M. Young, in Brooklyn; Mr. Samuel Insull, in Chicago, and Mr. J. H. Vail, in Philadelphia, the electrical profession owes no small debt of gratitude. Progress in electrical engineering is too vast for any step to be regarded as final, and it would not be very surprising to find in the course of another decade that even such great stations as that elsewhere described will in turn become substations of a still larger scheme. At present, though, it looks as if the limit in the size of stations may have been reached, as certainly the economical distribution of current leaves little room for improvement.

MUNICIPALISM IN ENGLAND.

England is regarded as the home of municipal ownership ideas; it is pointed to by the agitator as the place where his dreams of civic control of public utilities are realized at their best; it contains the best examples of such public service institutions profitably conducted by town corporations. But the inevitable result of municipal administration is beginning to be felt in that country. A highly significant paragraph in our British correspondence this week points to the demoralization of municipal politics in some of the larger cities of Great Britain that, directly or indirectly, has been brought about by making the opportunities for profitable venality so good. The quicker discernment and utter disrespect for conventional or traditional proprieties which distinguish the American politician from his British *confrere*, have for some time caused him to foresee the possibilities of "loot" which the municipal ownership situation contains, and he is beginning to argue for it with much propaganda of the socialist variety. Hitherto he has held up England and the admirable administration of its municipal institutions as an object lesson, and it has not been without effect, but to-day the object lesson is growing to be a "horrible example." With the labor agitator becoming prominent in British local politics, and the election of men of lower class to municipal offices will come the utter demoralization of the public service institutions they operate. Our correspondent tells us that high-class electrical engineers prefer to avoid engagements with municipal bodies on account of the demoralization which is already evident among these. There is no use to produce any further argument against municipal ownership than this—that it has been tried faithfully by an intelligent public in Great Britain and has failed.

Now that the compressed air "choo-choo" cars on Twenty-eighth and Twenty-ninth streets in New York city are destined to crown the scrap heap—that catacomb of engineering hopes—why not give the discarded accumulator car another chance? It has been a good many years since this city saw a storage battery car, and in that time, as the automobile has abundantly demonstrated, there has been a vast improvement in the construction of the batteries and also much has been learned about using them. Even if they were as inefficient as the antagonists of the system claim, they would probably prove less expensive in operation than a conduit system able successfully to cope with the peculiar difficulties that New York streets present. The ELECTRICAL REVIEW takes the liberty of calling the attention of its able and enterprising friend, Mr. H. H. Vreeland, to the above as food for profitable thought.

The telephone situation in the United States at the moment is something that few men can understand. The long fight between the Bell interests and the Independent companies seems to have resulted in the consolidation of the latter, with a sufficient capital to make them a factor in the situation now existing. Meanwhile, everybody anxiously awaits the outcome of the suit that has been brought in Boston to define the true status of the Berliner patent.

Volta and the Voltaic Cell.*

Professor Righi, in an eloquent discourse delivered at Como in connection with the Volta centenary, gave an account of the character and scientific work of Volta which deserves to be widely read. It is too long to be translated *in extenso* in our pages, but some of the more important passages may be read with interest.

The lecture was divided into five sections, with a preface, a conclusion and an appendix. The sections deal with the condition of electrical science before Volta's time, Volta's work, other than that in connection with the pile, the discovery of the electricity of contact, the discovery of the pile and the theory of the pile. The appendix, an essay on the theory of the pile, is an important contribution to this apparently interminable controversy.

Born in Como in 1745, Alessandro Volta, when little more than a boy, took for the subject of his poetical compositions the electrical experiments then in vogue, and the observations made by De Saussure on Mt. Blanc. These show that he was already well versed in these subjects, and of them he sought to improve his knowledge by maintaining an active correspondence with the Abbé Nollet, and other contemporary physicists. He was led, in short, to investigate electrical phenomena for himself, and when scarcely 24 years old dedicated his first memoir, "On the Attractive Force of the Electric Fire," to Beccaria, of Turin. This was followed, two years later, by another addressed to the celebrated Spallanzani.

In reading these papers, and particularly those which led him to the invention of the electrophorus, every one must be struck with the singular acumen with which he took account of every detail of his experiments, and with his great capacity for concentrating attention upon the favorable circumstances. Volta was led to the electrophorus by his attack on the theory of the so-called "electricita vindice," proposed by Beccaria to explain certain phenomena which had been observed by himself, and by Wilke, Epino and Cigna.

We know that, according to this theory, an electrified insulating plate placed in contact with a non-insulated conducting plate is deprived of electricity, and that on separating the two plates the first recovers the primitive charge, leaving on the now insulated conducting plate a charge of the opposite sign. Volta showed clearly that, instead of this being the case, the insulated plate retains its charge throughout unchanged, and that this induces an opposite charge on the conducting plate. The adhesion of the plates to one another during the period of contact confirmed Volta's explanation, and it only remained to give suitable forms and dimensions to the two plates and to put a third conducting plate under the insulator to construct the electrophorus.

To Volta we owe the discovery of the production of the so called "inflammable air" by the decomposition of organic bodies. He was the first to explode this gas mixed with air, and free from hydrogen, in a closed vessel by an electric spark, and was thence led to the invention of the gun and pistol still known by his name, of the eudiometer, now universally used in the analysis of gases, of the hydrogen lamp and of the apparatus which, four years later, enabled Cavendish to effect the synthesis of water.

An observation made by the illustrious Arago, in the course of a eulogy of our great physicist delivered before the Academy of Sciences, of Paris, may be aptly quoted here. He observed that "Volta possessed, in the highest degree, two great qualities which are rarely united in one man. The genius that creates, and the spirit that applies. He never abandoned a subject until he had considered it under every possible aspect, nor without having described, or at least suggested, instruments which might be employed by science, by industry or even by mere curiosity." We have a good example of this in a proposal suggested by his own discovery, and made by him in a letter addressed in 1777 to Professor Barletti. He proposed to fire an electrical pistol at Milan by the discharge of a Leyden jar at Como, the two being connected by a pair of iron wires, or alternatively by a single wire and a canal of water.

In this project, which, so far as is known, was not carried out, can be recognized the germ of modern electrical telegraphy. So the germ of the idea of gas lighting may be traced in a proposal made by Volta to Father Campi to employ natural inflammable gas in lamps instead of oil. Perhaps, too, the electrical pistol may be looked on as the first of the modern gas engines.

(To be continued.)

*A lecture delivered in Como, Italy, September 18, 1899, by Professor Augusto Righi.

Death of Vice-President Hobart.

Hon. Garrett A. Hobart, Vice-President of the United States, died at his home in Paterson, N. J., on November 21, at 8.30 A. M. Mr. Hobart was largely interested in electric lighting and electric railway enterprises, and had many acquaintances among electrical people. He was an intimate personal friend of Mr. A. M. Young, and had been associated with him in several electrical projects.

Completion of the Third Avenue Railroad in New York City.

After many harrassing difficulties, the electric service of the Third Avenue Railroad in New York city was finally completed on November 21. As has already been reported in the ELECTRICAL REVIEW, the lines of the old cable road on Third avenue, north of Sixty-fifth street, were opened for service with the electric cars some weeks ago. The completion of the line below Sixty-fifth street, to the loop terminus in front of the Post Office at Ann street, marks the final disappearance of another cable railway to make room for an electric conduit road. The difficulties that were encountered in placing the electrical equipment in the cable conduit were very great. Work began on changing over at 2 o'clock A. M. of November 19, when the cable was hauled out of the slot. Large gangs of men were put to work at taking out the pulleys on which the cable formerly ran and putting in the insulators and conductor rails. The method of taking out the pulleys was exceedingly simple, consisting of three or four sharp blows of the sledge-hammer on their bearings, and hauling the débris out through a hand hole into the street. It is expected that the Forty-second street and Boulevard line will be operating by electricity in about three weeks. At present current for the Third avenue line proper is being taken from the power house at Sixty-fifth street, which was described in the ELECTRICAL REVIEW of October 18. Great credit is due to the engineering force of the company for the accomplishment of extraordinary emergency work under most difficult conditions, and especially to Dr. Louis Duncan, the chief engineer.

Copper in Southwest Africa.

A correspondent of a London newspaper states that Mr. Alfred Beit, who is in Berlin negotiating with the Colonial Office concerning the Cape to Cairo railway and telegraph schemes, is also engaged in the exploitation of the Otavi copper mines, for which purpose it is proposed to form an Anglo-German syndicate. The syndicate will probably not be definitely constituted until next Autumn. For the present it has been resolved to send out an expedition of English and German experts to Southwest Africa at a cost of about £50,000, in connection with the proposed Southwest Africa railway scheme, and, at the same time, to study the possibilities of the copper there. It is stated that a report, according to which the capital of the company will amount to £1,000,000, must be considered premature.

PERSONAL.

Mr. W. J. Clarke, foreign manager of the General Electric Company, is in South America, but is expected in New York city about the first of the year.

Professor H. A. Rowland, of the Johns Hopkins University, Baltimore, has been elected a foreign member of the Royal Society, of Lombardy.

Professor Andrew Gray, Lord Kelvin's successor at the University of Glasgow, chose as the subject of his inaugural address, "The Interaction of Theory and Practical Applications in Physical Science."

Mr. A. K. Baylor, of the British Thomson-Houston Company, London, arrived in New York city last week, and Mr. H. F. Parshall, of the same company, and Mr. Robert W. Blackwell, the well-known London electrical man, are expected to arrive in New York this week.

Dr. Samuel W. Stratton, associate professor of physics in the University of Chicago, has been appointed director of the Bureau of Weights and Measures, United States Coast and Geodetic Survey. Dr. Stratton served with credit during the Spanish-American War, as a lieutenant (senior grade) on the U. S. S. Texas.

Mr. H. C. Cushing, Jr., the author of the handbook "Standard Wiring for Electric Light and Power," and who is well known in electrical and insurance circles, has appeared as an inventor. He is an enthusiastic golf player, and his matches on the Ardsley links led him to recognize the advantages of a combination golf club. He has, therefore, invented a combination club which includes three separate and distinct kinds of club. It is of the utmost simplicity and promises to become very popular.

Automobiles in Central Park, New York.

Automobiles will be allowed in Central Park, New York city, on and after Thursday afternoon of this week. This decision has been arrived at by the Park Board, and embodied in a resolution to rescind its ordinance making the running of an automobile in the Park a misdemeanor. The conversion of the Park Board is so complete, it is said, that even President Clausen is going to get an automobile in time to enter the Park at the head of the cavalcade on Thursday.

THE ELECTRIC PLANTS OF THE BATTLE-SHIPS KEARSARGE AND KENTUCKY.*

BY NAVAL CONSTRUCTOR J. J. WOODWARD, U. S. N.

The battle-ships Kearsarge and Kentucky are the first vessels of the United States Navy on which the use of electricity as a motive power for the ship's auxiliary machinery has been adopted to the practical exclusion of steam. And even in the case of these vessels a distinction has to be made between the auxiliary machinery for the general service of the vessel, such as deck winches, boat cranes, ship's ventilating fans, ammunition hoists and turret-turning machinery, all of which are operated by electric motors, and the auxiliary machinery connected with the main propelling engines, such as air, feed and circulating pumps, forced-draft blowers, ash hoists, etc., which on these ships are still driven by small steam engines. Further exceptions to the complete use of electricity for the ship's auxiliary machinery are the windlass and steering engines, which are also driven by steam.

The electric plants of the Kearsarge and the Kentucky can therefore only be regarded as an intermediate step between the complete steam drive for auxiliary machinery, so largely used in the past, and the practically complete electric drive for all auxiliary machinery of every kind whatsoever, whose adoption appears to be a possibility of the near future. Indeed the most serious present limitation to the extent to which the electric drive for auxiliary machinery may be adopted for service in war-ships is the time necessary for the officers of the naval service charged with the care of such plants to organize and train the necessary personnel for the care of the dynamos and motors, and to gain that confidence in their power to maintain the plant in a constantly efficient condition which is necessary to overcome the sense of conservative distrust so apt to be felt in a new appliance or method adopted for service on board ship.

For, more than in any other branch of engineering work, it is important that power appliances placed on board ship, and especially on men-of-war, shall be capable not only of working satisfactorily when installed, but that their maintenance in an efficient condition can be readily accomplished by the ship's force available for the purpose.

While a more extended use has been made of electrically driven auxiliaries on the Kearsarge and the Kentucky than on any other vessels of the navy up to the present time, attention should be called to the fact that the various types of electrically driven auxiliary machinery used on these vessels are the logical developments of generally similar types previously installed by the Bureau of Construction and Repair on other vessels of the navy. Thus, for example, the turret-turning machinery may be considered a development of that which worked in so satisfactory a manner on the Brooklyn's 8-inch gun turrets during the late war with Spain; the chain ammunition hoists are the same in general principle as those used on the Puritan and many other vessels; and the extensive systems of blowers and exhausters used in the ship's ventilation are similar in character to those placed on the gunboats Nashville and Wilmington two years ago, and which to-day are giving eminently satisfactory results, both from the point of view of thorough ventilation of these vessels and ease of maintenance of the ventilation plant in an efficient condition.

The above instances of the satisfactory working in service of electrical machinery installed by the Bureau of Construction and Repair on vessels of the navy may not unfairly be taken as a reply to the question as to the possible doubt of maintaining, in a constant state of high efficiency, such an electric plant as that installed on the Kearsarge and the Kentucky. And it is to be hoped that the results obtained in service with the electric plants of these vessels may be such as to definitely lay the ghost of this doubt once and for all. For one of the most marked advantages claimed for the electric drive, namely, its efficiency in coal consumption, will increase with the size of the engines employed to drive the electric generators used, and the larger the number and collective power of the electric motors operated, the greater will be the opportunity to obtain such economy in coal consumption.

As an illustration, on a battle-ship and an armored cruiser now building in this country for a foreign navy the electric drive is used for practically all auxiliary machinery, not only for the general service of the vessel, but for auxiliaries of the propelling machinery as well, with the result that the generating units are of such size as to permit of their being driven by triple expansion engines of the most efficient marine type, whose economy of steam consumption will unquestionably approach that of the main propelling engines.

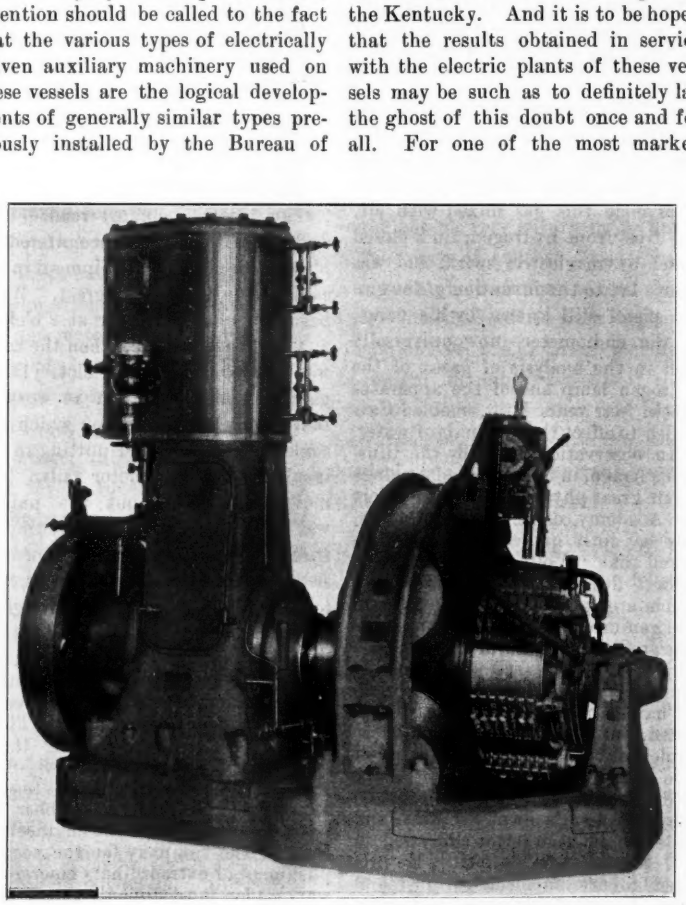


FIG. 1.—DIRECT-COUPLED MARINE GENERATING SET AS INSTALLED ON THE U. S. S. KENTUCKY AND KEARSARGE.

In submitting the following description of the electric plants of the Kearsarge and the Kentucky, the indulgence of the society is asked for the fact that no reference is made to tests of the various auxiliaries installed. As, however, the installation of these plants on board ship is only partially completed at the present time, it is impossible now to give the results of tests, and the efficiencies obtained on the tests of the various auxiliaries will have to be given later.

Briefly stated, the electric plants of the Kearsarge and the Kentucky perform the following duties:

1. The ship is lighted under peace and battle conditions.

2. Four searchlights are operated.

3. The Ardois signal set is operated for night signaling; also, various means of interior communication within the ship, such as battle and range order indicators, electric propelling and steering-engine telegraphs, revolution and helm-angle indicators, etc.

4. The truck lights and ship's running lights are operated, also portable diving lanterns.

5. The two turrets containing the 8-inch and 13-inch guns are rotated, the 13-inch guns elevated, ammunition hoisted for both 8-inch and 13-inch guns, rammers of 13-inch guns operated, and special ventilation provided to blow out gases in bore of 8 inch and 13-inch guns.

6. Ten endless-chain ammunition hoists are operated, eight of them supplying the 5-inch broadside guns, and two supplying 6-pounder and 1-pounder guns on upper deck. Two winch-type of hoists are operated, supplying ammunition to the 6-pounder guns in the after cabins.

7. Six deck winches are operated; four winches of a simple geared type with friction drum suitable for quick hoists of moderate loads as in coaling ship, and two winches of a compound geared type permitting either the quick hoisting of light loads or heavy pulls at low speeds. The simple geared winches are especially designed for use as ammunition hoists to the military tops.

8. Four boat cranes are operated, the boats being hoisted and lowered and cranes rotated by power.

9. The ship is ventilated throughout, including the engine rooms, but excluding the fire rooms, by thirteen ventilating fans, of which ten supply and three exhaust air for the various water-tight compartments.

*A paper read before the Society of Naval Architects and Marine Engineers, New York, November 16, 1899. (See also article on the electrical equipment of the Kearsarge in the ELECTRICAL REVIEW for September 27, 1899.)

10. The centering device on the hydraulic telemotor used to control the steam distribution valve of the steering engine is automatically operated.

The method of distributing electric energy upon the Kearsarge and the Kentucky is known as the Edison three-wire system. The object of this system is to allow the use of two pressures—eighty and 160 volts, the current required to deliver the same power being one-half as much on the latter as on the former voltage. This permits a material reduction in weight of wiring, switches, etc. It also allows much greater speed regulation of the motors, the half voltage giving at once a speed of one-half the full speed. The wires used for distributing on the three-wire system can be so connected as to operate any motor upon the ordinary two-wire system, but at a reduction of one-half of its capacity.

At least two dynamos are necessary for operating the three-wire system, these machines being run in series, the positive terminal of one generator connecting to the same bus-bar on the switchboard as the negative terminal of the other, and the free positive and negative terminals connecting to independent bus-bars.

This gives the pressure of one generator between the common or neutral bar and either of the other two. One of these latter will be positive and the other negative with relation to this neutral.

As these generators will run at eighty volts each, the potential of one bar, called the positive, is eighty volts above the neutral, and of the other, called the negative, eighty volts below, the difference between the positive and negative bars being 160 volts. The three wires carrying the current are led from positive, negative and neutral bars.

The motors and lights are so distributed and connected between the three wires that the two sides of the system will be very nearly balanced when everything is running, and will not be excessively disturbed by any condition which may arise when only a part of the system is in operation.

When it is necessary to run more than one dynamo the three-wire system should be used; but if the load be such that one dynamo can do the work, then, by the proper manipulation of switches on the main generator board, the system can be run in the ordinary two-wire manner. This is done by connecting together what were previously the positive and negative bus-bars on the switchboard, thus allowing all the current to flow in one direction on what was the common or neutral wire of the three-wire system, and in the opposite direction on the others.

This will allow any lamp or motor to be operated. The lamps will have the rated pressure of eighty volts, with full candle-power; the motors will only run at half the full rated speed, but the torque is unchanged. This means that, for example, in the case of a boat crane, the pull on the hook is the same, but made at half the full speed.

All the dynamos are controlled by a main switchboard located in the dynamo room. Permanently attached to the bus-bars of this board are three sets of feeders which supply three distribution boards. Each of these distribution boards supplies both light and power direct, and two of them feed auxiliary distribution boards which control only power.

The method of installing electric light and power circuits on these ships consists of a combination of porcelain, conduit and wooden moulding work, the exact kind employed being determined by the conditions of the individual location. In general, conductors are supported upon porcelain, except in cases where special protection is desirable, this form of installation being used in the greater part of the feeders and mains on the ship, except in the engine and fire rooms, magazines and places exposed to the weather. Conduit is used in the engine and fire rooms, magazines, coal bunkers, masts and beneath the bridges. It is also employed for the protection of all wires running vertically between decks and in certain contracted or special places. Wooden moulding is used for the greater part of the branches to individual lights above the protective deck.

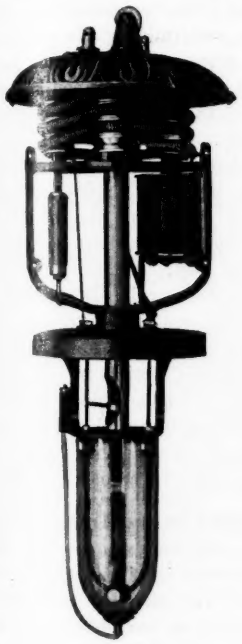
Porcelain work is of two kinds, open and enclosed. Open work, in which the wires are unprotected, is used in all places where there is no liability of mechanical injury or interference by irresponsible persons; *e. g.*, the dynamo rooms, wing passages, officers' quarters and offices, etc.

Enclosed porcelain work is employed in the crew's quarters and berthing spaces, storerooms, ammunition passages, etc. The cover for porcelain work consists of a U-shaped sheet-iron guard attached to the deck on each side of the wire. Ordinarily it is fastened to the deck above by screws, but in cases where such screws would project through the deck plating, and possibly allow water to leak below, screw studs are employed, which are riveted on the upper side, and thus made watertight, the cover being held by hexagonal brass nuts.

The generating plant is located between the inner wing bulkheads, frames 38½ to 41½, occupying all the space below the protective deck. This space has a platform midway of its height, and the lower half is divided into two compartments by the centre-line bulkhead and the passage between the fire rooms. The upper room contains three generating sets and the switchboards, and each of the lower rooms two sets.

There are seven 6-pole 50-kilowatt 80-volt compound-wound generators, each driven by a tandem vertical compound engine running at 310 revolutions per minute at 100 pounds steam pressure. The sets are placed with the shafts fore and aft, and rotate "against the sun," facing the commutators, which are at the after end. Each generator has supported from the upper frame a connection headboard and circuit-breaker, from which all cables and field and pressure wires are led. (Fig. 1, opposite.)

(To be continued.)



FIGS. 1, 2 AND 3.—ARC-LAMP NOVELTIES.

Arc-Lamp Novelties.

The accompanying illustrations represent types of enclosed arc lamps for a variety of circuits that combine several features of novelty and interest. Fig. 1 shows the lamp exhibited in Fig. 2, with its cover and globe removed and the mechanism exposed. The lamp is twenty-two inches long over all and its frame is made in one piece, so that even under rough usage it is not liable to suffer from getting out of line. The carbon-holder is a nickel-plated brass tube, and it is said that the method of handling the carbon in it avoids sticking, even when the carbon rod is crooked. No current flows through the clutch, which is said to be very strong and positive in action.

Fig. 3 shows a marine type of lamp made for either alternating or direct current and adapted to be mounted on shipboard. These types of lamps are constructed by the Lea Manufacturing Company, Elwood, Ind.

BRITISH NOTES.

[*From our special correspondent.*]

I start my letter this week with a feeling not far removed from despair. We have been living in stirring times; our minds are full of the war, of American friendliness and French enmity, for which last a day of reckoning will surely come, but the electrical world goes its way with comparative serenity, gorged with work, and taking about as much thought for the future as prosperous folk generally do. I talked with a man the other day who was, electrically speaking, well in the swim, and he said that he could see no prospect of any check to the present "boom;" fresh uses were suggesting themselves daily for electricity, and all that the manufacturing firms had to do was to overtake and keep abreast of orders. Journalistic evidence of this state of things is to be found in the disinclination of the trade to advertise. They argue, so I was told by the business manager of one of the most widely circulated electrical papers, that they have got as much as they can do and don't want more, and they decline to advertise accordingly. One, at least, of the electrical papers is accepting advertisements at a ruinously low rate, and all are, to some extent at least, feeling the pinch. It is useless to remind the public, as *Electricity* did not long since, that there are many factors in the situation that portend a reaction, and that, "when that day arrives, the firms which have provided against the future by keeping themselves before the public are those which will suffer least." It has always been characteristic of the Britisher to confine his outlook to the present—the "living present," as one of your poets has called it—and unexpected developments invariably catch him napping, and, I suppose, always will.

It seems certain, however, that one, perhaps the next-coming, development of the use of electricity will be in the direction of adapting small motors for doing a lot of the work at home and in shops which is at present done laboriously by human agency. The possibilities in this direction are unlimited, and the reduction in the price of current that would follow the establishment of a regular day load are very considerable. But the idea catches on very slowly—indeed, with our public, the wonder is that it catches on at all. The principal advocate for it in this country is Mr. A. H. Gibbings, the able electrical engineer to the Bradford corporation, who has done much to popularize the idea and to reduce it to popular shape, but the result has only been to create a personal prejudice against himself on the part of his employers. An attack has been made upon his character in the Council and in the press, and he has had to invoke the strong arm of the law in his defence. Like the unjust steward (and I hasten to add that herein lies the only point of likeness) he has provided for the future; two corporations are already competing for his services as a consultant, and his reputation will, no doubt, insure him a brilliant future in that capacity. But the incident is very typical of the fashion in which our municipal authorities treat the professional gentlemen whom they employ. Indeed, I know few more unpleasant positions than to be employed by an English municipality in any professional capacity; it is rapidly coming to a pass at which self-respecting men will prefer any employment to that. The reason is not far to seek. Like the Jewish king, we have "made priests of the lowest of the people." Men of standing and education will not subject themselves to the base imputations, the vulgar recriminations, and the pothouse ribaldry which are becoming so painfully common in our council chambers, while in the best conducted councils faction has much more influence than the voice of right reason. You are probably aware of the part which John Burns has played in exciting industrial unrest and strife during the past decade; you have only to realize that this man, a paid professional agitator, is one of the noisiest members of the London County Council and has even obtained a seat in the House of Commons, to understand how it is that the tone of our public life is so much below par. Possibly you in America, who have indirectly profited by the action of firebrands of this kind, which has undoubtedly sent much of our trade to you, will view the doings of John Burns and his followers with complacency; over here, I can assure you, the feeling is very different, and more than one ruined manufacturer would pay highly from his diminished resources to see Mr. Burns's head on a charger. Much of our electrical business is, as you know, falling into the hands of the municipalities, so that the state of municipal morals is a matter of considerable moment to electricians. And I may add, *en passant*, that Mr. Burns himself was once employed in an electrical firm—though I need hardly add that he was not a consultant.

And this reminds me that an interesting case will shortly be coming on for hearing, which has a very direct bearing upon the dealings of municipalities with company promoters, the parties in this instance being the Corporation of London and the City of London Electric Lighting Company. The point at issue is the validity of the concessions made by the city to the company in question, seeing that certain members of the city corporation (including the then Lord Mayor) were interested in the said company at the time of making the contracts, which, it is contended on behalf of the corporation, were thus rendered null and void, a view in which they are supported by high legal opinion. The corporation has, accordingly, repudiated the said contracts, and has permitted competition within the city, where a powerful competitor, the Charing Cross & Strand company, has now begun to lay its mains. The price charged by the City company for current was seven-pence per unit, which was nothing short of preposterous, when you consider that the two supply undertakings on either side—the Charing Cross company and the Shoreditch Vestry—supplied a steadier current for four-pence half-penny; and you can easily imagine that the City company is not going to allow such a fat morsel to slip out of its grasp without making a fight for it. For the moment they have reduced their prices to the level of their competitors, and are profuse in their promises of amendment, but the world knows very well that if they win this action and succeed in driving out their rivals, they will lay it on to the city with scorpions, where they were formerly satisfied with whips. It is not precisely an electrical item, but you will pardon me if I mention that the Lord Mayor who brought this stigma upon the city is a man "of exemplary piety," a temperance advocate, a preacher of Mr. Spurgeon's sermons, and generally a fiery Protestant, all of which traits he shared, I believe, with Mr. Jabez Balfour, the late Mayor of Croydon, of whom you may have heard. He brought an action for libel to clear his character in connection with this business, and failed rather ignominiously, but he remains an Alderman of the city of London still.

The leading article in the current number of the (London) *Electrical Review* merits consideration, being a thoughtful and well-considered contribution to the discussion of the labor problem. One of the tendencies of the day is to establish electrical factories in the country, so as to escape the filth and fog of London and the large manufacturing centres, which interfere with work and occasion waste of time in many ways. The supply of hands is then apt to become a difficulty, as the average workman is a town-bird, and finds the country dull. The suggestion made by the *Review* is that money laid out upon providing attractions for the workmen, good dwellings, a sports ground, a club and lending library and even a concert hall would be far from being spent in vain, besides undermining the influence of the agitators, who make a strong point in impressing upon the workers that if they don't care for themselves nobody else will do it for them. The establishment of more human relations between employers and employed is one of the needs of the day; both parties have been to blame in the past, and the paid agitator makes his sordid living by keeping the sore open in the present. If electricity contributes towards the healing of this terrible and mischievous feud it will have added yet another to its many substantial claims upon the gratitude of mankind.

London, November 10, 1899.

X-Rays in the Transvaal War.

Among those who have left for the front is Major W. C. Beevor, of the Royal Army Medical Corps, who takes with him a complete X-ray equipment, with which he will be able to render great service to his country and to those fine, brave fellows who are now fighting for us, by minimizing their sufferings in bullet localization and extraction. Major Beevor's practical experience with the apparatus in Indian warfare renders him eminently suited for the present service. He takes with him a Pidgeon influence machine, in which he is understood to have made certain alterations to enhance its fitness for the particular conditions under which it will be employed.—*London Electrical Review.*

Another Name for the Horse.

The Century Dictionary defines a horse as "a solidungulate perissodactyl mammal of the family *Equidae* and genus *Equus*." One trembles to think of what might have happened had its esteemed editor joined the ELECTRICAL REVIEW's late name contest.

ELECTRIC RAILWAY NOTES.

At Dover, Del., on November 11 these companies were incorporated: British Electric Street Tramway Company, to construct and operate electric street tramways in Great Britain and its colonies; capital, $5,000,000. London Electric Tramways Construction and Maintenance Company, for the purpose of constructing and operating electric street tramways; capital, $2,500,000.

The directors of the Third Avenue Railroad Company, of New York city, have declared a quarterly dividend of 1¼ per cent on the entire capitalization of the company, which is $16,000,000, being equivalent to about 1¼ per cent, which was usually declared before the capitalization was increased from $12,000,000. The earnings for the quarter, it was stated, justified a higher rate, but the directors followed a conservative course. The dividend is payable November 29.

The New York State Railroad Commission made several tests of street railway brakes last week on the Metropolitan company's tracks in Lenox avenue, New York city. Those who witnessed the tests were Railroad Commissioner Baker, Charles R. Barnes, electrical expert of the commission, and Oren Root, representing President H. H. Vreeland, of the Metropolitan Street Railway Company. When the State Railroad Commission announced that it would make a test of various brakes, fifty applications were received. Twenty-three were accepted as having points of merit. Fifteen have been tested.

There are 19 electric railways in the lower peninsula of Michigan, about which the State Labor Bureau furnishes the following particulars: The aggregate capital stock is $14,045,000, the average being $739,210. The largest is that of the three combined roads of Detroit, $7,000,000, and the smallest Adrian, $20,000; aggregate number of miles of road operated, 448, Detroit having 101 and Adrian 3; aggregate number of cars operated, 456; average of 24; aggregate number of employés in operating departments, 1,692; average 89. Detroit has 680. The aggregate monthly pay-roll for operating departments is $87,879; average, $4,625. Detroit's is $35,000, and Adrian, $260. Nearly every company reports that extensions and connections are either being made or are contemplated.

The Oroville (Cal.) Water and Power Company has been incorporated, with a capital of $250,000, by L. T. Lott and R. S. Power. The company will develop electric power.

Wall Street and the Electrical Stock Market.

The feature of the week was the offer of the Secretary of the Treasury to come to the relief of the monetary situation by redeeming $25,000,000 of outstanding four and five per cent government bonds. The announcement, which was made in Thursday's morning papers, resulted in a sharp and general rise in prices in the stock market. The tone and outlook for the market have been practically revolutionized through the offer of the purchase of the bonds. The market closed the week with a very firm undertone prevailing.

On the New York Stock Exchange General Electric closed the week at 126⅛ bid and 126¼ asked, a gain of 4¼ points for the week. Metropolitan Street Railway, of New York, closed at 195 bid and 195½ asked, a gain of 2½ points for the week. Third Avenue Railroad, of New York, closed at 147⅞ bid and 149 asked, a loss of 1 point for the week. Brooklyn Rapid Transit closed at 89¼ bid and 89½ asked, a gain of 3½ points for the week.

On the Boston exchange American Bell Telephone closed at 362 bid and 365 asked, a gain of 10 points for the week. Erie Telephone closed at 110 bid and 110¼ asked, a gain of 1¼ points for the week.

On the Philadelphia exchange Electric Storage Battery closed at no bid price and 121 asked, a gain of 1 point in the asked price for the week. Union Traction closed at 39⅜ bid and 39½ asked, a gain of 1⅛ points for the week. Electric Company of America closed at 15 bid and 15¼ asked, a gain of 1¼ points for the week.

On the curb or outside market in New York Electric Vehicle closed at 70 bid and no asked price, a gain of 3 points in the bid price for the week. Electric Boat closed at 20 bid and 22 asked, a loss of 3 points for the week. The Electric Axle, Light and Power Company is a promising new comer in the field whose stock sold up 2 points to-day, closing the week at $8 per share.

Wall Street, November 18.

Erie Telephone.

The directors of the Erie Telegraph and Telephone Company have voted unanimously to recommend to the stockholders that the capital stock be increased from $5,000,000 to $15,000,000, and ordered called a special meeting of stockholders to be held in New York, Friday, December 15, to act upon their recommendations.

Electrical Progress in Spain.

It is announced that as soon as the Chamber of Deputies meets for the session, a decree will be issued favorable to the construction of an electric tramway from Motril to Granada, which will run on the public highways. The Government, says the *Electrical Engineer*, will not grant any monetary subsidy, and will confine its help to allowing the motors to be used on the roads. The overhead trolley system will be used, and it is intended to put on six passenger cars, carrying fifty each, and thirty cars for goods transport. The undertaking appears to be large in comparison with the traffic expected, which is set down at only 100 passengers per day. In Barcelona and also in San Gugat del Valles, in the province, will shortly be installed electric light. In Barcelona tenders for supplying the streets with electric light for the next five years will be invited before long. The estimate for this work is about $175,000, or $35,000 per annum for the period of the concession. In Cadiz a concession is open for tender until the seventh of next month for an electric tramway through the streets of the city and also on some other roads in the district. There is also a project afoot to construct an electric tramway between the cities of Cadiz, San Fernando, Arsenal, Avanzadilla and Chichana. Most of the equipment and working of the numerous electric light stations in Spain has up to the present fallen into the hands of German, Swiss and French firms. Quite recently Messrs. Ahlemeyer have erected the turbines and dynamos for the central station at Axhana, but there appears to be no reason why our own firms should not take the trouble to compete. Spain has always had a more or less bad name on account of its public finances. but while this may apply to the government loans, the position of the municipalities is generally a healthy one, and even government securities are bound to inspire more confidence on the market now that the great annual drain of men and gold to the lost colonies has ceased.

It is announced that one of the New York hospitals is soon, through the contribution of a benefactor, to put in operation an electromobile ambulance. In addition to furnishing the motive power, electricity will supply light for lamps at night, operate a fan for ventilation in Summer and supply a battery within the ambulance.

An American Marconi Wireless Telegraph Company.

As intimated in the ELECTRICAL REVIEW for October 4, 1899, a scheme is on foot to incorporate a company for the exploitation of Mr. Marconi's wireless telegraph patents and apparatus in the United States. It is understood that an application for a charter will be made at Trenton, N. J., or Dover, Del., some time this week. It is stated that Mr. George S. Graham, ex-District Attorney of Philadelphia, is counsel for the proposed company, and that he will be interested in it. The proposed capitalization is placed at $12,500,000, of which $2,500,000 will be debenture stock. Prominent capitalists of New York, Boston, Philadelphia and Chicago are said to be interested. Mr. Graham is quoted as saying that the Marconi people have been recently conducting experiments between Boston and the International Air Power Company's plant at Providence, R. I. The distance between Boston and Providence is about forty-five miles. Mr. Graham is also quoted as stating that the proposed company has acquired the patent of an American inventor which, it is alleged, Mr. Marconi's patents infringed. Whether this patent is that of Professor Dolbear, mentioned in the ELECTRICAL REVIEW for October 11, 1899, or that of Mr. Mahlon Loomis, quoted in the ELECTRICAL REVIEW of November 15, 1899, is not known.

It will be remembered that the Signal Corps of the United States Army recently made tests of the Marconi system, and it was reported that General Greely would not adopt it for several reasons, one of which was the fear of involving the government in a patent controversy. The United States Navy Department also tested the system between several vessels and the Highlands of Navesink at Sandy Hook, but the report of the board of officers who made the experiments has not yet been made public.

Electromobile Speed Test.

Justice B. Entz and Hiram T. Maxim, of Philadelphia, on November 17, made an attempt to break the automobile record with an electromobile. Three cyclers, with cyclometers, measured off a distance of fifty miles from Atlantic City, N. J., to a point four miles east of Berlin, Camden County. The automobile left the Windsor Hotel at 8.30 o'clock and returned at 4.14 o'clock, covering the 100 miles at an average speed of fifteen miles an hour.

The Metric System.*

In a paper on the "Metric System," published in the *London Times* in 1896, Herbert Spencer, in opposing its introduction, begins by declaring that the "advocates of the metric system allege that all opposition to it results from ignorant prejudice," which he very properly declares is far from true. What is far more dangerous as an obstacle to human progress, and often far more common, is what may be called "intelligent prejudice," meaning thereby an obstinate conservatism which makes people cling to what is or has been, merely because it is or has been. It will be convenient to consider the objections offered by Mr. Spencer in the order in which he has presented them in the four separate letters which go to make up his article. Mr. Spencer reproduced in quotation a considerable part of the well known argument of Sir John Herschel, written and widely published over thirty years ago, in which he claimed, first, that the metre was not exactly the ten-millionth of the terrestrial meridian passing through France, which was entirely correct, and that, therefore, it was not a good unit for international use, which does not at all follow. He further attempted to show that the polar radius of the earth, which could never be known except indirectly, was a better unit than the quadrant, a large part of which could be measured directly, and that this radius differed by only eighty-two yards from 500,500,000 English inches. He then proposed to increase the English standard by its one-thousandth part, so as to furnish what he declared would then be "a system of linear measurement the purest and most ideally perfect imaginable." It has always been a surprise that so able a mathematician and astronomer could have overlooked the inherent weakness in such an argument. The simple facts are that while in the beginning the metre was made to be as nearly as possible one ten-millionth of the meridian, no one imagined that it could be exactly so, or rather that we could ever know that it was exactly so. It is sufficiently near that value to be very convenient in calculations relating to terrestrial distances and areas, but it must always be considered as defined by a material standard, and no metrologist ever thinks of it in any other sense. Before beginning the exposition of his own views, he ventures to quote another objector to the metric system in the person of Professor H. A. Hazen, of the United States Weather Bureau, who some time ago argued that its adoption would necessarily include that of the centigrade thermometer scale, and that as, in his opinion, this was very bad, the metric system must be very bad.

Mr. Spencer objects to the metric system as, although it is a century old, it has not yet, even in France, entirely driven out some of the old denominations and units. In reply to this it may be said that little research is required to reveal innumerable examples of persistence in the use of words and things for more than 100 years after their betters were available. The next objection is worthy of more serious consideration, and it has been given (for it has long been discussed) a good deal of weight by many thoughtful people. It refers to the alleged universal tendency to continual bisection, thus leading to the use of halves, quarters, eighths, sixteenths, thirty-seconds, sixty-fourths and, sometimes in subdividing the inch, one-hundred-and-twenty-eighths. To begin with, the existence of any such inherent tendency is quite open to discussion, but, without going into that, it is at least plain that it has never shown itself in the evolution of systems of weights and measures. In all, as well as in the English money units and denominations, there is no indication whatever of this "natural tendency" toward continual halving. It is a common practice, possibly growing out of a tendency in some degree natural, to continually bisect a single unit. What possible objection can there be to speaking of a half or a quarter or an eighth of a mile or rod or yard or inch, if one wishes to do so? And no more can there be to a half, quarter, eighth or sixteenth of a kilometre, kilogramme, metre, gramme, centimetre, millimetre, etc., nor, again, to the use of such fractional parts as thirds, fifths or sevenths, if they seem to be desirable. But to compare the two systems in this respect one should undertake such a problem as finding the value of a third, quarter, fifth or eighth of a mile, or a ton in rods, yards, feet and inches, or hundredweight, pounds, ounces, drams and grains, and then do the same thing in the metric system. The enormous superiority of the latter will at once be revealed. On the other hand, it can not be denied that there is, and has been for many years, a strong tendency toward the decimal subdivision of single units, even among users of our own clumsy system of weights and measures. In weight, for instance, in the United States it has been long ago decided that a hundredweight shall be 100 pounds, as its name implies, and not 112 as in England, and our ton is almost universally 2,000 pounds, although they still retain the traditional ton of 2,240 pounds in certain transactions; and, as if to emphasize the utter absurdity of the thing, in some parts of New England a "long" or "gross" ton of coal weighs 2,200 pounds. In many extensive calculations the avoirdupois pound is adopted as the only unit of weight, and fractional parts are expressed in tenths, hundredths, etc.; and this is found to reduce the labor of such calculations enormously. In length measure the tendency toward decimalization is still more marked. In land surveying and in engineering operations it is now the all but universal practice to use the foot as the unit and multiply and divide decimally.

In accurate machine shop practice the use of decimal divisions is becoming almost universal. The unit is generally the inch, and it is subdivided into tenths, hundredths, thousandths, etc. "True to one-hundredth, or one thousandth, or one ten-thousandth of an inch" is heard a hundred times oftener in every shop than "correct within a sixty-fourth or a hundred-and-twenty-eighth," etc., and it means not only greater convenience of expression and measurement, but an actually higher standard in precision of workmanship. To the objection, then, that the tendency of mankind is toward a binary rather than a decimal division of units, which is almost the only one offered by Mr. Spencer worthy of serious consideration, we may briefly reply by saying that even granting it to be a fact, it has no bearing whatever on the questions of ratios and relations of units, which is what distinguishes one system from another; that such a tendency may find expression in one system as well as another, and certainly with infinitely greater facility in the metric system than that now in use among English-speaking people; and, furthermore, that the estimation of fractional parts by tenths or hundredths is believed by many who habitually work that way to be both easier and more accurate than by halves, quarters, eighths, etc., and as a matter of fact the prevailing tendency is away from the latter and toward the former.

Mr. Spencer resorts to quotation, and brief reference should be made to the arguments set up by some of his authorities. The letter of Sir Frederick Bramwell contains some remarkable statements. His assertion that the new system will require "more figures to perform ordinary sums than on our present system, when rightly applied," is so grossly incorrect, as may be easily proved by a few examples, that no time need be spent in controverting it. The same might be said of his further assertion that it is more likely to lead to error, and, above all, to the common error in placing the decimal point. This last statement is frequently made, and it is worth while, therefore, to call attention to the fact that in all ordinary business transactions in which the decimal system is used, and in all calculations for that matter, the error of a misplaced decimal point is one of the rarest of all errors. This is because of the generally quick and certain detection of such a mistake. To misplace the decimal point by the smallest possible amount is to change the result tenfold, and usually so great an error is instantly detected by means of approximate knowledge or other checks. Take the United States' own money system, for example; it is perfectly safe to say that other mistakes are a million times more frequent than a persistent, undetected misplacing of the decimal point. Yet, curiously enough, considerable weight has been given to this objection to the metric system of weights and measures, which is, on the contrary, vastly less liable to errors of computation than that now in use. Sir Frederick also furnishes an extensive extract, giving the views of the first Napoleon on the subject of reform in weights and measures. Many of the stock arguments are repeated, and if they had not been thrashed over long ago it would be perfectly easy to take them up one by one and show their absurdity. An entire lack of any really accurate knowledge of the subject and an absence of any sort of conception of the simplest metrological principles are shown in a single quotation: "A toise, a foot, an inch, a line, a point, are fixed portions of extensions, which the imagination conceives independent of their relations one to another; if, then, we ask for the third of an inch, the mind goes into instant operation. The length called an inch is divided into three parts. By the new system, on the contrary, the mind has not to divide an

*Extracts from a paper by Professor T. C. Mendenhall, president Worcester Polytechnic Institute, in Appleton's *Popular Science Monthly*.

inch into thirds, but a metre into a hundred and eleven parts." It is difficult to properly characterize such utter nonsense; but, fortunately, the French people, who are to-day the leaders in the world's metrology, were not obliged to take their science, as they were most other things, from the first consul. A group of the most distinguished Frenchmen of any period had perfected this system, even in the very midst of the bloody revolution which closed the last century, and when their final report was made in an address to the legislative chambers by the celebrated La Place, the event was described by Adams as a "spectacle at once so rare and so sublime . . . that not to pause for a moment, were it even from occupations not essentially connected with it, to enjoy the contemplation of a scene so honorable to the character and capacities of our species, would argue a want of sensibility to appreciate its worth. This scene formed an epoch in the history of man. It was an example and an admonition to the legislators of every nation and of all after times."

Mr. Spencer also quotes from an auditor who had to go over £20,000 of accounts, and who was "very thankful that it was not in francs" At first blush it seems entirely natural and creditable to him as an Englishman to rejoice that his twenty thousand is in pounds sterling rather than francs; but, after all, his remark is only a reflection of that not uncommon English sentiment that the imperial monetary system is more perfect than any other in the wide world. This sentiment is doubtless the outgrowth of national pride and intellectual inactivity; it is not entertained by the majority of the more thoughtful and scholarly Englishmen, and, furthermore, it is in every respect false. It is unnecessary to consume time in quoting the opinion of England's most distinguished scholars to show this.

I must be content to stop without reference to a few other points raised by Mr. Spencer, for they are essentially all of a kind. There is a sentiment underlying much of his argument, to which I must briefly refer, however, because it has shown itself in other recent discussions of this subject. I refer to an anxiety lest the "poor man" be in some way injured by the proposed reform. It has come to be the fashion in all political or economical controversies to exhibit a consuming interest in the poor man's welfare; indeed, one marvels that there should continue to be any poor, so universal and so intense appears to be this anxiety to shield them from all harm. Fortunately, the so-called "poor man" is not so blind to his own interests as some would have it appear, and he is quite alive to the fact that the proposed metrological reform is fully as important to him as to anybody.

Finally, it ought to be understood that the advocates of the metric system do not assume that it can come into use immediately or without considerable hardship. It took nearly a century to fairly establish the decimal money system in the United States, which no one would now think of giving up. During all this time old units and denominations continued to be used in a lessening degree, although not authorized by law. Something of the kind must occur in the transfer from our illogical, brain-destroying, time-consuming system of weights and measures for the more perfect system for which it is sure to make way. Furthermore, they heartily welcome and desire the presentation of all arguments against or objections to the metric system, believing that the more widely it is known and discussed the more supporters it will have. They expect to meet occasionally such "intelligent prejudice" as is exhibited by Mr. Herbert Spencer, whose contribution to the discussion of the subject is sure to be considered in the years to come as altogether the most remarkable to be found in any time or tongue.

OUR CANADIAN LETTER.

WROXETER, ONT.—A company has been formed here to install an electric light plant.

NEWCASTLE, N. B.—T. Duncan, engineer, is preparing plans for the proposed electric light system.

BEAR RIVER, N. S.—An agitation is on foot to construct an electric railway from this place to Digby.

SEVERN BRIDGE, ONT.—It is said that Mickle, Dyment & Son will supply electric lighting to the village.

HESPELER, ONT.—The Galt, Preston & Hespeler Street Railway Company will build a new station at this place.

BRACERBRIDGE, ONT. — There is talk of an electric railway being built to connect Bracerbridge with adjacent points.

MURRAY BAY, QUE.—The American visitors at this place are forming a company to establish an electric light plant.

WESTON, ONT.—R. H. Leighton, Village Clerk, invites offers for purchase of $7,000 of electric light debentures.

VALLERFIELD, QUE.—The Montreal Cotton Company are excavating for a large extension for their electric power house.

JANETVILLE, ONT.—The promoters of the Lindsay, Bobcaygeon & Birkton Railway held a meeting last week to further the scheme.

WOODSTOCK, ONT.—The question of municipal ownership of the electric light plant is engaging the attention of the Council.

STRATHROY, ONT.—The Strathroy Electric Light Company have refused to furnish electric light at the price offered by the Council.

GRAND FORKS, B. C.—It is said that $30,000 will be expended within the next three months in improving the electric light system.

ASHCROFT, B. C.—The Ashcroft Water, Electric Light and Improvement Company propose installing additional electrical apparatus.

SHELBURNE, ONT.—The Council is still considering the taking over of the existing electric light plant or the installation of a new one.

PORT ARTHUR, ONT.—The Ontario & Rainy River Railway Company is preparing to construct a telegraph line from this place to Duluth.

WINNIPEG, MAN.—The Bell Telephone Company have decided to build a long-distance line between Winnipeg, Portage la Prairie and Neepaua.

ALMONTE, ONT.—The by-law to authorize the Town Council to borrow $30,000 to establish an electric light plant was defeated by the ratepayers last week.

GODERICH, ONT.—The Water and Light Committee of Council recently asked for power to purchase two 100-light transformers and belts for engine and dynamo.

NEW WESTMINSTER, B. C.—A local company has been formed to manufacture electric light carbons, they having secured the water-power rights on the Stave River.

ROSSLAND, B. C. — The Rossland & Sophie Mountain Electric Railway Company is seeking incorporation. Messrs. T. J. Duncan and W. A. McDonald are interested.

WOODSTOCK, ONT.—Messrs. Ickes & Armstrong have accepted the franchise for an electric railway, as offered by the town, and the work of building will be commenced at an early date.

NIAGARA FALLS, ONT.—The Town Council is considering the proposal of the Niagara Central Railway Company for the extension of the road and its conversion into an electric line.

NEW WESTMINSTER, B. C.—It is understood that work will be commenced at an early date on the proposed tramway station and shed for the British Columbia Railway Company.

ST. CATHERINES, ONT.—The Niagara Central will this week commence the conversion of the road between this city and Niagara Falls into an electric line. The extension to Port Dalhousie will be also undertaken at an early date.

QUEBEC, QUE.—Plans will be prepared at once for a large building for the Jacques Cartier Electric Light and Power Company to be built at the corner of St. John's and d'Aiteuil streets. Mr. Ed Slade has been appointed manager of the company.

LEVIS, QUE. — The Council is about to construct an electric light system, and invites competitive plans for same. These plans are to be received by January 1, 1900, the first prize to be $1,000 and the second $500. Particulars can be obtained from Flavien Roy, secretary-treasurer of the municipality.

HAMILTON, ONT.—It is stated that the Cataract Power Company syndicate will, at an early date, commence work on the proposed roads to Galt, Geulph and other cities. A double track will be built to Rock Chapel, and a single track to Geulph, Galt, Berlin and Waterloo. Grading will likely commence this Fall.

BRACERVILLE, ONT.—C. H. Mitchell, C. E., has made a report to Council concerning the proposal to increase the power for electric lighting purposes. The proposed improvement will give an increase of about 600 horse-power, and will cost about $20,000. The power house will be built at the foot of the falls.

OTTAWA, ONT.—The Ottawa Car Company have purchased a property on Albert street for the purpose of building an extension to their car shops. The Metropolitan Electric Company expect to commence the construction of their power house this week. Tenders are invited for delivering 1,000 yards of blue clay at their works at Brittannia Bay.

J. A. C.

Montreal, November 14.

Telephone News .....and Comment

It is predicted that the Erie telephone system will have gained 43,000 subscribers at the close of 1899.

The Western Electric Company, of Chicago, has notified licensees of the American Bell Telephone Company that all royalties heretofore paid on switchboards and bells would be canceled beginning October 31, last.

It is reported from the City of Mexico that G. and O. Branniff have secured a contract for the construction of telephone lines for the Mexican War Department, and that the Electric Railway Equipment Company, of Cincinnati, has secured a contract for the necessary poles.

It is stated that, since January 1, the Central Union Telephone Company has absorbed by purchase, lease or otherwise, sixteen independent exchanges in Illinois and three toll-line companies operating 500 miles of wire. In addition to the above, the company holds an option on seven more companies.

The Missouri & Kansas Telephone Company, Mr. J. R. Mulvane, president; Mr. N. R. Ferguson, secretary; Mr. Alonzo Burt, general manager, is sending out its quarterly dividend of one and one-fourth per cent for the quarter ending September 13, 1899. This company is one of the best managed of the Bell licensee companies, and has its headquarters in Kansas City. It takes in the territory covered by Missouri outside of St. Louis and Kansas, Oklahoma and the Indian Territory.

A Wireless Telegraphy Newspaper.

Mr. Marconi, who was a passenger on the steamship St. Paul, which reached Southampton on November 15, installed aboard the ship a set of his wireless telegraphy apparatus with which he communicated to the signal station at The Needles when the vessel was forty-five miles away, as follows: "All aboard well; everything satisfactory." Mr. Marconi asked the signal station at The Needles for the latest Transvaal war news when the St. Paul was sixty six miles away. As the voyage neared its end, Mr. Marconi published a paper on the St. Paul which he called the *Transatlantic Times*. It contained all the news he received from The Needles in response to his wireless telegraph inquiries. The news included a summary of the South African situation and a story regarding the loss of the U. S. S. Charleston off the coast of Luzon. The paper was sold for $1 a copy, and the money was donated to the Seamen's Fund. A passenger, when the steamer was forty miles from shore, sent a wireless telegram arranging for a supper party in London on his arrival. Other passengers also availed themselves of this method of communication. On the arrival of the St. Paul at Southampton, six of Mr. Marconi's assistants took another ship and sailed for Cape Town, where they will start for the scene of the war to operate wireless telegraph instruments already on the ground. It is reported that the new British battle-ship Canopus will be fitted out with wireless telegraph apparatus.

An Expansion Dinner.

Marking the initial shipment of street railway equipment from the port of Philadelphia, for the new street railway in Havana, a banquet was given to about thirty prominent electrical and railway men at the Bingham House, Philadelphia, on Tuesday, November 14.

Mr. Elmer P. Morris, of New York, presided as host and toastmaster, and after an excellent and artistically served menu, the following impromptu toasts brought more or less happy responses: "The Future of Electric Railways," responded to by Mr. John Blair McAfee, vice-president of the Compania General de Tranvías, Philadelphia; "Expansion," Mr. Stephen Goddard; "Electricity as Applied to Steam Railroads," Mr. C. C. F. Bent, superintendent of the Baltimore & Ohio Railroad; "Progress of Electric Railways," Mr. C. B. Fairchild; "Felicitations," Mr. Geo. F. Porter, secretary of the National Electric Light Association. Among others present were Messrs. S. H. Harrington, Chas. A. Bragg and Geo. E. Pratt, all of New York; Mr. W. E. Harrington, manager of the Suburban Railway Company, Camden, N. J.; Messrs. J. F. Stevens and W. K. Beard, Philadelphia; Mr. Geo. Mason, Washington. In compliment to Mr. Mason, whose factory furnished fifty car loads of conduit for the mains of Havana, the ices were served in the form of "four-duct" conduits.

This shipment will be followed by others of engines, tools and equipments, aggregating in all 182 car loads. The order for the equipment of the entire system, 27 miles, having been given to the Morris Electric Company, New York. It will be wholly constructed with American factory products by American engineers.

American Institute of Electrical Engineers.

The 137th meeting will be held at 12 West Thirty-first street, New York city, Wednesday, November 22, at 8 P. M., and at the Technical Club, 228 South Clark street, Chicago, on the same date and hour, standard time.

A paper will be presented by Edward J. Willis, of Richmond, Va., on a "Test of a 300-Kilowatt Direct-Connected Railway Unit at Different Loads." On the same evening, at both places, there will be a topical discussion on "The Possibilities of Wireless Telegraphy."

The discussion will be opened at New York by Professor R. A. Fessenden, of Allegheny, Pa., and at Chicago by Arthur V. Abbott. Members who have given special attention to this subject have been invited to participate, and apparatus will be exhibited. The usual privileges of the Technical Club will be extended to western members on the evening of the meeting.

The municipal electric light plant at Negaunee, Mich., is said to be in such bad shape that the town has to charge itself more for street lighting in order to keep down deficit from the operation of the plant.

Compensated Revolving Field Generators.

It is well known that when the load on an electric generator—direct or alternating—is increased, the potential will drop unless the field excitation is also increased. This is due to the resistance of the armature, the inductance of the armature, and the reaction of the armature on the field poles, the latter reducing the amount of effective magnetic flux. The potential at a distant point, when the current is used for lights or motors, falls even more on account of the resistance and inductance of the line.

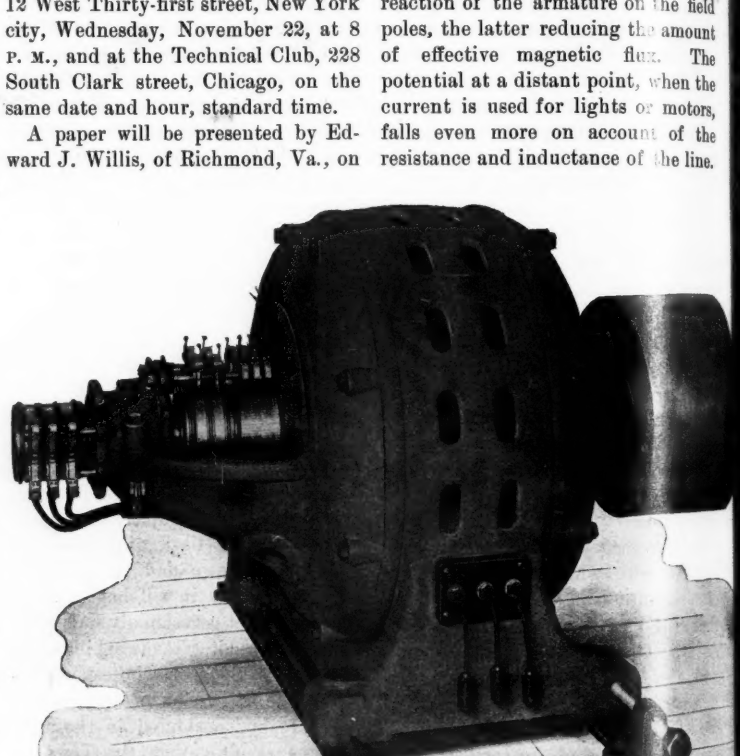


FIG. 1.—A 75-KILOWATT, 60-CYCLE, EIGHT POLE, THREE-PHASE, COMPENSATING REVOLVING FIELD ALTERNATOR.

To compensate for this, direct-current dynamos have been compounded by passing the main current through series coils on the poles, and so adjusted that the potential at the machine increases with increasing load. On alternating and polyphase machines the same result has been obtained by rectifying the main or an induced current, and using it for the same purpose; and, except for a slight increase in complication, the method is just as effective as on direct-current machines, so long as the alternating current is in phase with the potential. This, unfortunately, is rarely the case in ordinary operation, since partly loaded transformers and induction motors produce a lagging current which requires a greater field excitation to produce the normal potential. This has not heretofore been provided for, but is in the case of the machines to be described.

The line of machines as developed and now being built by the General Electric Company are belted and will fill the wants of installations where the greatest trouble is experienced; *i. e.*, where the size of the motor units is likely to be a large per cent. of the size of the generator units.

The design is based on a principle radically different from anything which has heretofore been employed. The new feature is the method of excitation, and gives an automatic compounding claimed to be superior in results to that which can be obtained by other methods, and at the same time there is nothing but simple and reliable mechanism used.

The distinctive advantage of this method of compounding is that it automatically adjusts the potential for all variations and degrees of inductive and non-inductive load without any mechanical change or adjustment. In any alternator, to maintain a given potential with a given inductive circuit requires a larger amount of field excitation than is needed with the same potential and load if the circuit is non-inductive. Thus, in types of alternators heretofore designed, the compounding required for non-inductive loads has been entirely insufficient for inductive conditions. With the loads that ordinarily have to be provided for on alternating-current circuits there are wide variations in the power-factor, especially in cases where a considerable proportion of the load is in motors. Consequently, the achievement of an automatic means of field adjustment for all kinds and degrees of load is of great practical value.

The means by which this result is accomplished are as follows: The shaft of the generator which carries the revolving field also carries the armature of the exciter, which has the same number of poles as the alternator, so that the two operate in synchronous relation. Besides the commutator, which delivers current to the field of the alternator and to the fields of the exciter, it also carries three collector rings. On these collector rings is received current from one or several series transformers inserted into the lines leading from the alternator. This alternating current, passing through the exciter armature, reacts magnetically upon the exciter field in proportion to the strength and to the phase relation of the alternating current. In consequence thereof the magnetic field, and hence the voltage of the exciter, is due to the combined effect of this shunt field and the magnetic reaction of the alternating current.

The connections between the armatures of the two machines are so made that the polarities induced in the exciter armature are somewhat ahead of the exciter field magnetization, but still so that they will assist the field magnets. The result is that with increasing main current the current passing through the exciter armature strengthens the exciter fields and thereby the fields of the generator. If the current lags, as under an inductive load, the magnetization produced by the alternating current in the armature comes more nearly in line with the exciter field magnetization, thus strengthening the field more with a given line current. This is so adjusted as to give the necessary rise of exciter voltage as the non-inductive load increases, and, without other adjustment, to give a greater rise of exciter voltage with the addition of inductive load. These are said to be the first machines in which this result has been accomplished, and they are consequently claimed to be the only perfectly compounded alternators. They accomplish the desired result with accuracy and without liability to sparking or trouble.

In addition to the exciter armature and its commutator, the alternator shaft carries two sets of collector rings, one set delivering direct current to the alternator field, and the other set delivering alternating current to the exciter armature, as described. The commutator and all the collector rings are fitted with carbon brushes, and all operate at pressures below 75 volts so that all parts may be freely handled under all conditions. No alternating current is rectified, as in other compound alternators, and no conditions exist which will produce trouble through sparking or improper brush action. In fact, one of these machines require no more care than that which is generally bestowed upon the exciter of a separately excited alternator. With each alternator is furnished a transformer of compact design for the purposes described above and a small rheostat which is connected in series with the exciter field winding. These can be mounted wherever convenient. No other accessories are required with the machine, except such switchboard arrangements as the service may demand. The dynamo proper is of the revolving field type with stationary distributed armature winding, the design being such that a vigorous ventilation is maintained through all parts.

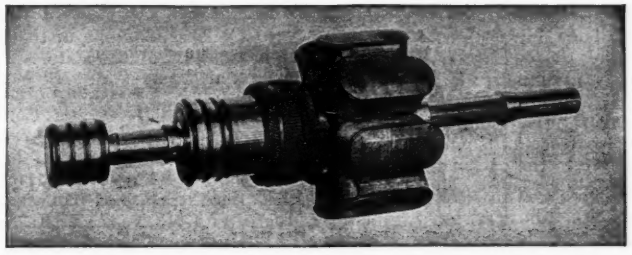


FIG. 2.—REVOLVING FIELD AND EXCITER ARMATURE ON THE SAME SHAFT.

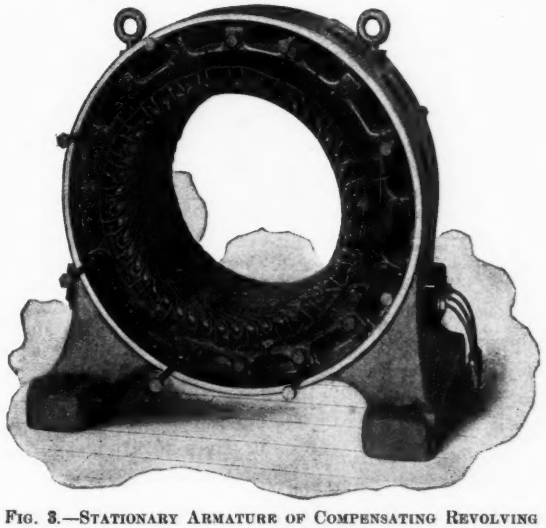


FIG. 3.—STATIONARY ARMATURE OF COMPENSATING REVOLVING FIELD GENERATOR.

The armature coils are insulated in the same manner that coils for high potential machines are insulated. The coils are held in place by wooden wedges. This fastening allows the coils to be easily removed, and has been found very satisfactory in the vast amount of machinery built in this way. The poles of the revolving field are built up of laminations and are fitted into dovetail slots in the steel hub with taper keys. These keys are easily driven out, so there is no trouble to remove or replace a pole-piece. The field coils are made of flat strip copper, wound on edge, each coil consisting of a single spiral, paper being used to insulate between successive turns.

The mechanical design of these machines is compact and convenient. All parts are readily removable. The distribution of weight and pull is such as to give a particularly good action on the bearings. The machines stand on rails so that the belt tension can be adjusted. These dynamos are said to be so proportioned as to afford practically effective use of all the magnetic material. The efficiencies obtained are consequently stated to be high, and the weight of the machines per kilowatt output is small.

The standard designs for these machines are adapted to three-phase or two-phase windings without change, save in the coils themselves, the exciter and all accessories being the same for both.

These machines are said to carry their full rated capacity, two or three-phase non-inductive load, continuously with a rise of temperature not exceeding forty degrees centigrade in any part, and it is claimed that they will carry twenty-five per cent overload for two hours without rise of temperature exceeding twenty-five degrees centigrade above the surrounding air.

The machines can be operated at their full three-phase rating when they are used to deliver power for both lighting and motor service with the lighting distributed for one phase only, and the motors connected to all three phases. The machines can be operated in this way where the lighting load is a large proportion of the whole. The reason for this is that the motors tend to draw most of their power from the phases which operate at the highest voltages; consequently, the motors tend to correct the unbalanced condition that arises from the operation of lights from a single phase. This is of great practical value, as a single-phase current is, for many reasons, more convenient than polyphase current for lighting purposes.

ADVANCE INFORMATION

Electric Light and Power.

TRENTON, N. J.—The Shamokin Light, Heat and Power Company has been incorporated; capital, $150,000.

ANNISTON, ALA.—A light and power plant will be erected here by the Anniston Electric Company.

TALLAHASSEE, FLA.—The city has voted to issue $16,000 bonds for electric light plant. Address the City Clerk.

TUSCUMBIA, ALA.—The city will erect an electric light plant. Address the Mayor.

DETROIT, MICH. — The Howard City Electric Light Company has decided to rebuild its plant, which was burned some time ago, and expects to have it running in about 30 days.

DECATUR, ILL.—The Culver Company, of Woweaqua has been incorporated; capital, $10,000; incorporators, J. H. Culver, J. S. Culver, F. H. Culver.

ALLIANCE, OHIO — The Alliance Gas and Electric Company, with a capital stock of $165,000, has been incorporated.

PETERBORO, ONT. — The Central Ontario Power Company will soon be organized to build the proposed power plant at Burleigh Falls, 17 miles from here, by which it is proposed to furnish this city and Lindsay with power and light. Surveys and plans have been completed, and it is probable that work will soon be begun. It is said that $1,000,000 in bonds will be issued. Richard Harcourt, Minister of Education, Toronto and Ottawa, Ont., Jas Kendry, president Auburn Power Company, Peterboro, and J. Alexander Culverwell, electrical engineer, Toronto, are interested.

TOLEDO, OHIO—Bids will be received November 27 for lighting Districts 1, 2, 3 and 4 with gas or electricity for a period of five years. William O. Holst, City Clerk.

DUNDEE, ILL —The Citizens' Light, Heat and Power Company has been incorporated with a capital of $10,000. O C. Fitts, Frederick Rossow and F. A. Johnson.

BELFAST, N. Y.—An electric light plant is to be established here.

CRYSTAL SPRINGS, MISS. — The Mayor and Board of Aldermen has passed an ordinance to issue $25,000 in bonds for the purchase of a complete system of waterworks and electric lights. This action is due to the recent expensive fires.

BOERNE, TEX.—A $4,000 electric light plant will be put in by local capitalists.

PITTSBURGH, PA.—The Chartiers Light and Power Company has sold its plant and franchise to the Mellon Brothers, of Pittsburgh, who are also said to be the purchasers of the McKee's Rocks electric light plant and a number of other plants in the Monongahela Valley for the purpose of consolidating and improving them.

New Electric Railways.

CLEVELAND, OHIO—Cleveland capitalists, including M. J. Mandelbaum & Company, F. D Pomeroy, D. H. Kimberly and A. E. Akins, are back of a project to build the longest trolley line in the world in the Miami Valley, in the southern part of the state. They have already obtained control of the electric railroads connecting Cincinnati, Hamilton and Dayton, and are operating them as one system. The company will soon be incorporated and extend the railroad north to the end of the valley.

MONTCLAIR, N. J.—The Montclair Town Council has granted a franchise to the North Jersey Street Railway Company for a railway to the south end of the town, through Elm street and Orange road to the Orange line. The ordinance provides for a ten-cent fare to Orange from Manhattan when a direct route is made.

PINE BLUFF, ARK. — The City Council of Pine Bluff has granted to Matthew Roberts, of Kansas City, a 50-year franchise for an electric street railway. Its requirements are that the company operate six miles of roadway and, at least, five new and modern cars, which shall be run at intervals of not less than 30 minutes. The road is to be completed within 12 months, or the franchise forfeited.

DECATUR, ILL.—A new electric railway is to be built, at once, from Decatur to Springfield, a distance of 38 miles. The cost will be about $300,000.

CONCORD, N. H.—It is reported that the proposed electric road from Centre Harbor to Ossipee is to be constructed in the Spring. Dr. J. A. Greene, G. W. Armstrong and A. Shuman are said to be interested in the enterprise.

NORWALK, OHIO — The County Commissioners have granted a franchise to W. W. Graham, of Norwalk, and Clark Rude, of Sandusky, the projectors of the Sandusky, Bellevue & Norwalk Electric Railway. By the terms of the franchise the road must be completed by July 1, 1900, unless delayed by compulsory legal process.

SHEBOYGAN, WIS.—The work on extension of the electric line to Sheboygan Falls will, in all probability, be completed by December 1.

New Telephone and Telegraph Companies.

SALT LAKE CITY, UTAH—The Soda Springs & Gray's Lake Telephone Company has been incorporated; the capital stock is $10,000; F. M. Merrill, E. W. Barnes, J. Strachan, H. C. Gorton and F. M. Merrill, Jr., incorporators. The purpose of the company is to construct, maintain and operate a telephone line from Soda Springs north to Gray's Lake, and also a line from Soda Springs south to Preston. At Preston the company's line will connect with the Rocky Mountain Bell Telephone Company's lines and give Soda Springs direct communication with Salt Lake City.

AMERICUS, GA.—The Southern Bell Telephone Company will soon rebuild its plant at this place, putting it upon a metallic basis entirely. The company also proposes to extend its lines from Americus shortly to Cordele, Abbeville and Fitzgerald, thus completing its excellent long-distance service in this part of the state.

YORKTOWN, VA.—The Chesapeake Telephone and Telegraph Company has been incorporated to construct and maintain telephone and telegraph lines; capital, $20,000; incorporators, E. E. Sleight, B. F. Crockett, E. S. Moore, of Crab Neck; G. L. Smith, T T. Hudgeons, of Yorktown; T. S. Harris, of Tampico; H. R. Wilson, of Yorktown.

OAKLAND, CAL.—The articles of incorporation of the Oakland Automatic Telephone Company have been filed. The company proposes to equip its plant at once and establish a system. The capital stock is $350,000. The directors of the new company are Albert C. Aitken, of San Francisco; William A. Magee, Charles B. Taylor, Samuel S. Theller and E. C. Dozier, all of this city.

RED LODGE, MONT. — The Red Lodge & Wyoming Telephone Company has been incorporated to construct and operate telephone line; capital, $10,000; incorporators, B. E. Vaill, J. L. Robbins, W. A. Talmage, all of Red Lodge.

MONTICELLO, IND. — The White County Long-Distance Telephone Company has been incorporated. The capital stock is $5,000, and the directors are David E Ross, John H. Smeale and Ira Bordner.

NEVADA, MO.—A. S. Munsell & Company, of Atchison, Kan., are building an independent telephone system from Nevada to connect with Kansas City, Topeka and Pittsburg, Kan. It will include a number of smaller towns.

WILMINGTON, DEL.—The Delmarvia Telephone Company is extending its lines to Highlands and Henry Clay.

New Incorporations.

KEOKUK, IOWA — The Garton-Daniels Company, to manufacture and deal in electrical supplies, has been incorporated; capital, $25,000; incorporators, J. C. Daniels, W. R. Garton, L. J. Titus, M. H. Titus, J. V. E. Titus, all of Keokuk.

CLINTON, N. Y. — The Clinton Electric Company has been incorporated; capital, $50,000; incorporators, J. N. Williamson, of Ozone Park; T. W. Cantwell, of Albany; T. F. McBride, J. L. Dempsey, of Clinton.

JERSEY CITY, N. J.—The Chaquette Electric Dredge Company, principal office the Corporation Trust Company Building, to build and use dredges, pile drivers, etc.; capital, $1,000,000; incorporators, Ephraeim Chaquette, Berthold Block, Michael J. Fenton, Kenneth K. McLaren.

PORTLAND, ME.—The Electric Car Lighting and Ventilating Company has been organized at Portland for the purpose of manufacturing and dealing in electrical appliances of all kinds, with $500,000 capital stock. The officers are, president, C. H. Morse, of Cambridge; treasurer, W. M. Chapman, of Needham.

CLEVELAND, OHIO — The Cotter Electric Company, of No. 1254 Case avenue, has been reorganized; F. L. Browne purchasing a half interest in the property and patents. The new firm will be known as the Cotter-Browne Electric Company, with offices at No. 912 New England Building and factory at the Perkins-Power block. The new concern will manufacture a flashing switch and other electrical specialties.

REYNOLDSVILLE, PA.— The Reynoldsville Electric Company, with a capital stock of $75,000, has been incorporated.

SAN FRANCISCO, CAL.—The Boynton Vacuum Company has been incorporated to manufacture and sell vacuum pumps; directors, H. G. Walker, Oakland; E. D. Moore, H. M. Graham, James S. Hunt and C. H. Boynton, San Francisco; capital stock, $500,000.

Increase of Capital.

PLAINVILLE, CT.—The Trumbull Electric Company has filed a certificate of increase in its capital stock from $2,000 to $5,025.

NEW YORK, N. Y.—A call has been issued for a special meeting of the stockholders of the Commercial Cable Company, to be held on December 4, when the proposition to increase the capital stock from $10,000,000 to $15,000,000 will be decided. The object of the proposed increase is not stated.

United Electrical Contractors' Association.

A meeting of the United Electrical Contractors' Association of the State of New York was held at Troy and Albany on November 14. A banquet was given in the evening at the Hotel Ten Eyck, Albany, which was attended by about seventy members and guests.

The officers of the association are Rudolph Schmidt, Rochester, N. Y., president; David Cronin, Syracuse, N. Y., vice-president; J. C. Sterns, Buffalo, N. Y., treasurer, and Wells Dygart, Buffalo, N. Y., secretary. The above, with E. F. Lester, W. H. Morton and E. G. Bernard, are the directors.

Kindred.... ...Interests

The Victor Telephone Journal is a trade paper published in the interests of the well known Victor Telephone Manufacturing Company, of Chicago. It ably represents the object which it is designed to accomplish.

Whitney Instruments, especially the new types described in the ELECTRICAL REVIEW of November 15, are fully illustrated in a new catalogue issued by Messrs. Machado & Roller, 203 Broadway, New York, which also gives much interesting information concerning these and other instruments of all types.

The Federal Battery Company, of New York, who manufacture "Federal salt" and "Federalite" for batteries, report that their sales have been far in excess of expectations for the month, and duplicate orders are pouring in every day, especially from telephone companies. An attractive catalogue will be sent on application to 11 Pine street.

The H. C. Roberts Electric Supply Company, 831 Arch street, Philadelphia, has purchased the good-will, stock and fixtures of the Franklin Electric Supply House, 506–508 Cuthbert street, Philadelphia. Future orders should be addressed to the Roberts company, and orders now on hand at the Franklin House will be filled by it. Claims against the Franklin Electric Supply house will be settled by Mr. H. P. Feister, proprietor, and checks for accounts due the Franklin Electric Supply House should be drawn to the order of Mr. Feister and addressed to him at 2215 West Tioga street, Philadelphia.

Where to Sleep—His excellency, Senor Ignatio Mariscal, vice-president of the Mexican Republic, in speaking of his trip from Buffalo to New York, by the New York Central, says: "The trip was so comfortable and so fast that I could not help going to sleep and having a good night's rest." Vice-President Mariscal has been in the habit of having his train sidetracked at night so as to allow him to sleep, but he found the track of the New York Central so perfect that he had a most excellent night's rest while speeding across the Empire State at over 50 miles an hour.—*From the Buffalo Commercial.*

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SEC. 2. In no case shall the duplicate report so retained by the Company be opened to the inspection of the directors, officers, or employés of this Company, nor shall the contents be made known except upon authority of a resolution of the Board of Directors of the Company.
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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED NOVEMBER 7, 1899.

636,234 Process of and apparatus for electrolytic decomposition of saline solutions; E. Baker, Winchester, Mass.

636,241 Method of and means for controlling systems of distribution; C. A. Brown, Chicago, Ill.—Consists in interposing in the field-circuit of the generator a variable factor controlling the magnetic field of said generator, altering said factor to suit the condition of the working circuit of said generator, and transferring to other portions of the system the excess of energy diverted to the field-circuit of the generator.

636,244 Portable igniter plant; A. W. Crosby, Geneseo, Kan.

636,270 Vacuum arc light; J. H. Loos, Orange, N. J.

636,275 Signal for telephone trunk-lines; F. R. McBerty, Downer's Grove, Ill.

636,276 Signal for telephone trunk-lines; F. R. McBerty, Downer's Grove, Ill.

636,277 Apparatus for interoffice trunk-lines; F. R. McBerty, Downer's Grove, Ill.

636,286 Automatic electric switch; E. F. Porter, Boston, Mass.

636,304 Apparatus for effecting silent electrical discharges; Alex. Vosmaer, Haarlem, Netherland—A discharger consisting of a plurality of metal pins clamped between strips of metal, in combination with a flat or even plate, against which the pins of said discharger are directly presented, and suitable electrical connections for the discharger and plate.

636,308 Device for inflating pneumatic tires; J. F. Wilson, Jetmore, Kan.

636,313 Means for controlling railway trains; H. Biermann, Breslau, Germany—Comprises a time-clock work, a cooperating clock work, both located at a station, a line circuit controlled by a moving train, and comprising conductors, and an electromagnet for moving the cooperating clock work in synchronism with the time-clock work, means for closing the magnetic circuit and means for giving an alarm when the two clock works are out of synchronism.

636,318 Battery; C. E. Burroughs, New York, N. Y.—Inner and outer electrodes and intervening absorbent material of a battery-cell, a fluid-proof disk extending between the electrodes at the top of the cell and a body of absorbent material above said disk.

636,321 Electro-metallurgical process of extracting native copper; T. Craney, Bay City, Mich.—Consists in making the mass or boulder the containing vessel and anode of an electrolytic cell, by first forming a cavity therein and then electrolytically depositing the copper upon a cathode in presence of a suitable electrolyte.

636,336 Incandescent-lamp holder or receptacle; G. A. Harter, Chicago—An article of manufacture, a series of lamp receptacles having their respective electrical contacts properly disposed and partly surrounded with a plastic material common to all.

636 358 Electric arc lamp; R. Schefbauer, Jersey City, N. J.

636,360 Electric switch; Ferd. Schwedtmann, St. Louis, Mo.—A base piece having a groove formed therein, two spring-strips in said groove and adapted to make contact with the switch-blade, a central strip inserted between said spring-strips within said base, and means for securing said parts together.

636,366 Telephone system; E. P. Trayer, New York, N. Y.

636,376 Electric igniter; J. S. Blackburn, Salem, Ohio—A stationary electrode, a cylindrical casing, a piston-plunge, operating against a spring therein and exposed to the pressure of the contents of the working cylinder, and a friction-jointed arm carried by said plunger and constituting an electrode.

636,379 Electric cutout; J. Erikson, Providence, R. I.—Consists of a fusible wire, a transparent cylinder or case surrounding said wire, a filling in said cylinder, that will be visibly changed by the fusing of said wire, a tube or case to enclose said wire and its cylinder, one or more openings made in the side or sides of the case, caps on the ends of the tube or case, wires connecting said fusible wire with the caps.

636,420 Coin-controlled mechanism; A. E. Watkins, Jersey City, N. J.

636,441 Lightning arrester; D. Messick, Timberville, Va.

636,453 Electric igniter for gas engines; J. W. Raymond, Oil City, Pa.

636,458 Automatic magnetic circuit-breaker; W. M. Scott, Philadelphia, Pa.—Consists of separable cooperative contacts, a pivoted lever and a fixed guide, so disposed that the engagement therewith of a projection of said lever in its rotary movement in one direction will cause the engagement of said cooperative contacts.

636,475 Insulating joint; C. Wagner, New York, N. Y.

636,486 Electric-circuit closer; J. J. Busenbenz, Chicago, Ill.—Consists of a rotatable chamber containing a relatively stationary contact, and a contact supported in said chamber to turn independently thereof and sweep across said stationary contact to close the circuit.

636,492 Flash-lamp; J. L. Cohen, New York, N. Y.—A flash-light apparatus comprising a casing to contain the battery, and having clips with a detachable post and trough to fit in the clips.

636,519 Transmission of sound; Elisha Gray, Highland Park, Ill.—In a bell, means for ringing the bell by the direct action of magnetic lines of force pulsated at the vibrational rate of the fundamental tone of the bell.

636,520 Transmission of sound and device for carrying same into effect; Elisha Gray, Highland Park, Ill.—A bell, magnets in pairs to produce magnetic lines of force to act upon the bell, a multiphase alternating generator the phases of which are connected with alternate pairs of magnets.

636,552 Means for preventing improper manipulation of air brakes; W. B. Potter, Schenectady, N. Y.—An air brake and an electric brake, and means whereby the failure of one causes the setting of the other.

636,565 Safety-fuse; J. Sachs, New York, N. Y.—An electric safety cutout having a fusible wire, a casing for enclosing the same, a second conductor exterior to casing and also connecting the terminals and a covering to the second conductor.

636,577 Electric apparatus; H. W. Smith, Pittsfield, Mass.—A pair of terminals, an enclosed arcing-space between the same, an escape-passage therefrom and a spreading and chilling device over and adjacent to said escape-passage to tend to interrupt the arc.

636,578 Thermal cutout; C. P. Steinmetz, Schenectady, N. Y.—Comprises a conductor adapted to heat under a predetermined strength of current, and a body of an explosive actylide compound in heat-conductive relation to the conductor.

636,604 Automatic railway-signal; J. M. Williams, Danville, Va.

636,638 Means for interrupting earth currents; W. Cramer, Hagen, Germany—An electrical tramway whereof the rails are used as return conductors, a trough-like shield of good, electrically-conductive material, enclosing the track or the rails at a distance, and in connection at the supply-station with the same pole of the dynamo as that to which the rails are connected for intercepting vagrant currents.

636,656 Electric time clock; G. E. Frank, Scranton, Pa.

636,676 Sanitary attachment for telephone-transmitters; W. Lenderoth, New York, N. Y.

REISSUE.

11,780 Electrically-propelled vehicle; L. Krieger, Paris, France—Consists of steering wheels and independent armatures independently connected to said wheels.

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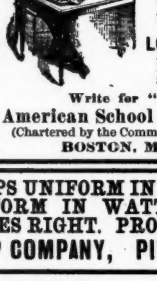

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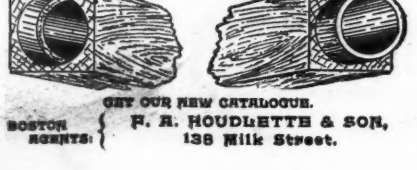

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